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PRESSURE AND TEMPERATURE FOR B-1B TRANSPARENCY TEST

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FOREWORD

This report was prepared by Mr. Elijah W. Turner and Mr. John T. Riechers, Aerospace Engineers in the Loads and Criteria Group, Structural Integrity Branch, Structures Division at Wright-Patterson AFB, Ohio. This effort was performed to generate pressure and temperature data for life cycle testing of the B-1B transparency.

This effort was conducted in support of Project 24010505, B-1B TRANSPARENCY TEST, which is managed by Vehicle Subsystems Division (WL/FIV), Mr. Richard Smith, Project Engineer. Testing will be conducted by the Structures Test Branch (WL/FIBT), Mr. John V. Anselmo and Mr. Ray Fisher, Test Engineers.

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ABSTRACT

Pressure and temperature data are presented for life cycle testing of the B-1B transparency. For each of three mission types, contour plots of pressure and temperature are presented for each mission segment. Potential flow theory was used to calculate pressure. Isentropic flow was assumed for calculating temperature.

TABLE OF CONTENTS

1. INTRODUCTION

Aircraft cockpit transparencies (canopies or windshields) must withstand extremes of temperature and pressure that result from climatic and aerodynamic conditions. They are complex laminates of plastics chosen to provide optical clarity and protection from bird impact and other hazards. They are thick enough to generate significant internal stresses when the temperature changes rapidly, such as when the aircraft changes speed or altitude.

Life cycle testing is accomplished by subjecting the transparency to a schedule of temperature and pressure combinations that are expected to produce damage equivalent to the service life of the transparency. The temperature and pressure are determined from the intended use of the aircraft which is described by mission types and mission segments. Most mission names are descriptive, such as Training, Air-To-Air Combat, Air-To-Ground Combat, etc. Other names, such as Red Flag, are less descriptive. Each mission type consists of a number of mission segments, such as Takeoff, Cruise, Terrain Following, etc., which describe the operation of the aircraft for a period of time during the complete mission. Associated with each mission segment is a combination of aircraft configuration (weight, center of gravity, wing sweep, flap position, gear position, etc) and flight condition (altitude, Mach number.) This information is required to calculate flight loads, including pressure and temperature. When details of the aircraft configuration or flight condition are not supplied, they must be estimated by the analyst.

Selecting mission types and mission segments to represent the service life of a transparency is an art subject to much speculation. It is a balance between complexity that may offer improved accuracy and simplicity that will expedite testing. With respect to this technical memorandum, the mission types and mission segments were given. The objective of the effort reported herein was to produce compatible temperatures and pressures on the surface of the transparencies. A similar analysis was accomplished for the F-111A aircraft in 1987 by Moon [1].

2. ANALYSIS

2.1 B-1 Fuselage Surface Geometry

The geometry required for the aerodynamic analysis was obtained from a NASTRAN model of the B-1A aircraft forward fuselage. This was a computer file defining the location of structural nodes in three dimensional space. The NASTRAN model was originally generated by ASIAC (Aerospace Structures Information and Analysis Center) for the B-1A aircraft using surface geometry. In general, NASTRAN models the structural character of the aircraft utilizing geometry interior to the mold line. In this case, however, ASIAC used the surface geometry, thus providing the geometry needed for an aerodynamic analysis. A graphics workstation was used to check the data. A few interior points were identified and eliminated.

The surface geometry of the NASTRAN model was compared with a computer printout for the B-1B aircraft obtained from the B-1 System Program Office (SPO). The most significant deviation for the area of interest was approximately one inch located at a point on the top centerline of the aircraft near the aft of the transparency (body station 317). Closer to the nose the deviation was less than 0.1 inch. The difference in geometry between the B-1A and B-1B aircraft was judged to be insignificant with respect to calculating pressure and temperature on the transparency.

2.2 Aerodynamic Panels

The surface geometry was input to the Configuration Data Management System (CDMS) [2]. CDMS accepts data from a variety of sources and has a host of capabilities including the ability to manipulate surface grids while retaining the surface geometry. The surface geometry was input to CDMS using an interface program, TAPEIGES, which is part of CDMS. Utilizing the I3G program of CDMS, a surface grid was generated for the aerodynamic computer program QUADPAN [3]. QUADPAN is a Lockheed Company proprietary aerodynamic panel code.

A total of 1914 aerodynamic panels were used to modeled one-half of the forward fuselage. Body panels were used from the nose to a point 225 inches aft of the transparency where wake panels extended the cross-section to a point 1179 inches aft of the transparency. Of the 1914 aerodynamic panels, 861 were body panels located on the transparency, 873 were body panels not located on the transparency and 180 were wake panels. This paneling was judged to provide accurate modeling for an aerodynamic analysis. A listing of the area associated with each aerodynamic panel in the vicinity of the transparency and the location of the aerodynamic center of each panel is listed in appendix D. Appendix D also

presents the center and radius of curvature for cross-sections in the vicinity of the transparency.

2.3 Aerodynamic Analysis

The CDMS computer program was used to generate the geometric input data for the QUADPAN aerodynamic computer code. Additional data was then added to execute QUADPAN for the combinations of Mach number and angles of attack listed in table 1. This produced an aerodynamic database for subsequent use in an analysis program written for this effort.

Table I

Mach Number	Body Angle-of-Attack			
.30	0	4	8	
.56	0	2	4	
.70	0	1	2	3
.75	0	1	2	
.85	0	1	2	
.91	0	1	2	

QUADPAN is a low order panel method that solves the Prandtl-Glauert equation. The flow field is assumed to be derivable from a velocity potential, which does not permit recirculation or separation of the flow field. Shocks are not considered although the Prandtl-Glauert equation accounts for Mach number by geometric scaling in the flow direction. The body is modeled by a closed system of body panels to which an open system of wake panels is attached. Each body panel consist of a distributed source and doublet singularity. The source singularities permits the volume of the fuselage to be modeled. Wake panels consisting of doublet singularities are attached to the trailing edge of the last streamwise body panel. The wake panel singularities are of constant strength in the streamwise direction and serve to assure that the wake leaves the body tangentially. In effect, they model the starting vortex, and therefore must extend down-stream far enough for the starting vortex not to influence the flow over the body panels. Doublet singularities on the body and in the wake model the aerodynamic lift.

Executing the QUADPAN computer code generates a dump file that contains all of the results produced by the program. This file is in a format that is described in the QUADPAN computer manual. A computer program CANOPY was written to read the dump file and extract the aerodynamic pressure coefficients for each panel. A listing of this program is presented in appendix G.

2.4 Mission\Mission Segment Analysis

Three missions entitled "Dyess Training Mission 1", Dyess Training Mission 2", and "Red Flag Training Mission" were

evaluated. The missions segments for each of these missions together with pressure and temperature calculations are presented in appendix A, B, and C respectively.

Computer program INTERP, which is listed in appendix E, was written to calculate pressure and temperature on the transparency and output results in a format needed for the life cycle test. INTERP accessed the aerodynamic database generated by QUADPAN. Mach number data closest to the mission segment Mach number was selected. Linear interpolation was used between angle of attack tables. An atmospheric database was incorporated in INTERP that provided the absolute pressure, temperature, density and speed of sound for a standard atmosphere as a function of altitude. Temperature was calculated using equation 1, which assumes adiabatic flow.

$$T = T_\infty \left(\frac{p_\infty + C_p\left(\frac{1}{2}\rho V^2\right)}{p_\infty} \right)^{\frac{\gamma-1}{\gamma}} \qquad (1)$$

2.4.1 Output Geometry

Contour plots of pressure and temperature were generated for the fuselage surface in the vicinity of the transparency. The abscissa is the fuselage station and the ordinate is the distance from the top center-line of the aircraft measured along a cross-section. The constant pressure for each contour line is listed in a table to the right of the plot.

The ordinate was calculated by assuming each cross-section of the transparency to be a circular arc. Three points were used to determine the radius and center of curvature of each arc. Points closest to the top and bottom of the transparency were selected as well as points closest to the middle. The location of the center of curvature and the radius of the circular arc are given in equations 2, 3 and 4. These equations were implemented in computer program SURF which is listed in appendix F.

$$Y_o = \frac{Z_3^2 - Z_1^2 + Y_3^2 - Y_1^2 - 2B(Z_3 - Z_1)}{2\left[M(Z_3 - Z_1) + Y_3 - Y_1\right]} \qquad (2)$$

$$Z_o = MY_o + B \qquad (3)$$

$$R_o = \sqrt{(Z_o - Z_1)^2 + (Y_o - Y_1)^2} \qquad (4)$$

$$\text{Where: } M = \frac{Y_1 - Y_2}{Z_2 - Z_1}$$

$$\overline{Y} = \frac{Y_2 + Y_1}{2}$$

$$\overline{Z} = \frac{Z_2 + Z_1}{2}$$

$$B = \overline{Z} - M\overline{Y}$$

2.4.2 Output Pressure

The contour plots for pressure present the pressure differential across the transparency in pounds per square inch (PSI). A positive value indicates that the cockpit pressure is greater than the external pressure, resulting in a net outward pressure. The external pressure was calculated using equation 5, where C_p is the pressure coefficient.

$$P = P_\infty + \left(\frac{1}{2}\rho V^2\right) C_p \qquad (5)$$

The internal pressure was determined from the pressurization schedule for the B-1B aircraft. Cabin pressure was maintained at the static pressure of the atmosphere for altitudes from sea level to 8000 feet. For altitudes above 8000 feet, the cabin pressure was maintained at 10.916 PSI, which is the ambient pressure for 8000 feet.

2.4.3 Output Temperature

Contour plots of temperature present the temperature of the airstream external to any boundary layer on surface of the transparency, given in degrees Fahrenheit. Potential flow was assumed, thus neglecting all viscous heating of the boundary layer. No consideration was given to heat flux that would result from temperature gradients through the transparency.

3. CONCLUSIONS

1 Temperature and pressure were determined for the B-1B transparency for the purpose of life cycle testing. The calculations were based on potential flow aerodynamics and adiabatic boundary conditions. It is believed that these assumptions are reasonable for the range of Mach numbers up to 0.91.

2 Pressure was presented in pounds per square inch differential pressure across the transparency, positive for a net outward acting pressure.

3 Temperature was presented in degrees Fahrenheit on the outside of any boundary-layer on the surface of the transparency. Heating due to viscous action was not considered. No heat transfer was considered.

4 Temperature and pressure were presented in the form of contour plots with the abscissa given in fuselage station and the ordinate given in terms of distance along a cross-section from the top centerline of the aircraft.

4. REFERENCES

1. Moon, Young In, "AERODYNAMIC PRESSURES ON THE F-111A FORWARD FUSELAGE," ASIAC Report No. 386.1E, Aerospace Structures Information and Analysis Center, WL/FIBR, Wright-Patterson AFB, Ohio, August 1987.

2. LaBozzetta, W. F., Cole, P. E., Kreis, R. I., Finfrock, G. P., "CONFIGURATION DATA MANAGEMENT SYSTEM," AFWAL-TR-87-3064, Air Force Wright Aeronautical Laboratories, Wright-Patterson AFB, Ohio, December 1987.

3. Youngren, Harold H., Bouchard, Eugene E., Coppersmith, Robert M., "QUADRILATERAL ELEMENT PANEL METHOD (QUADPAN)," LR 30563, Lockheed Proprietary, Lockheed-California Company, 1984.

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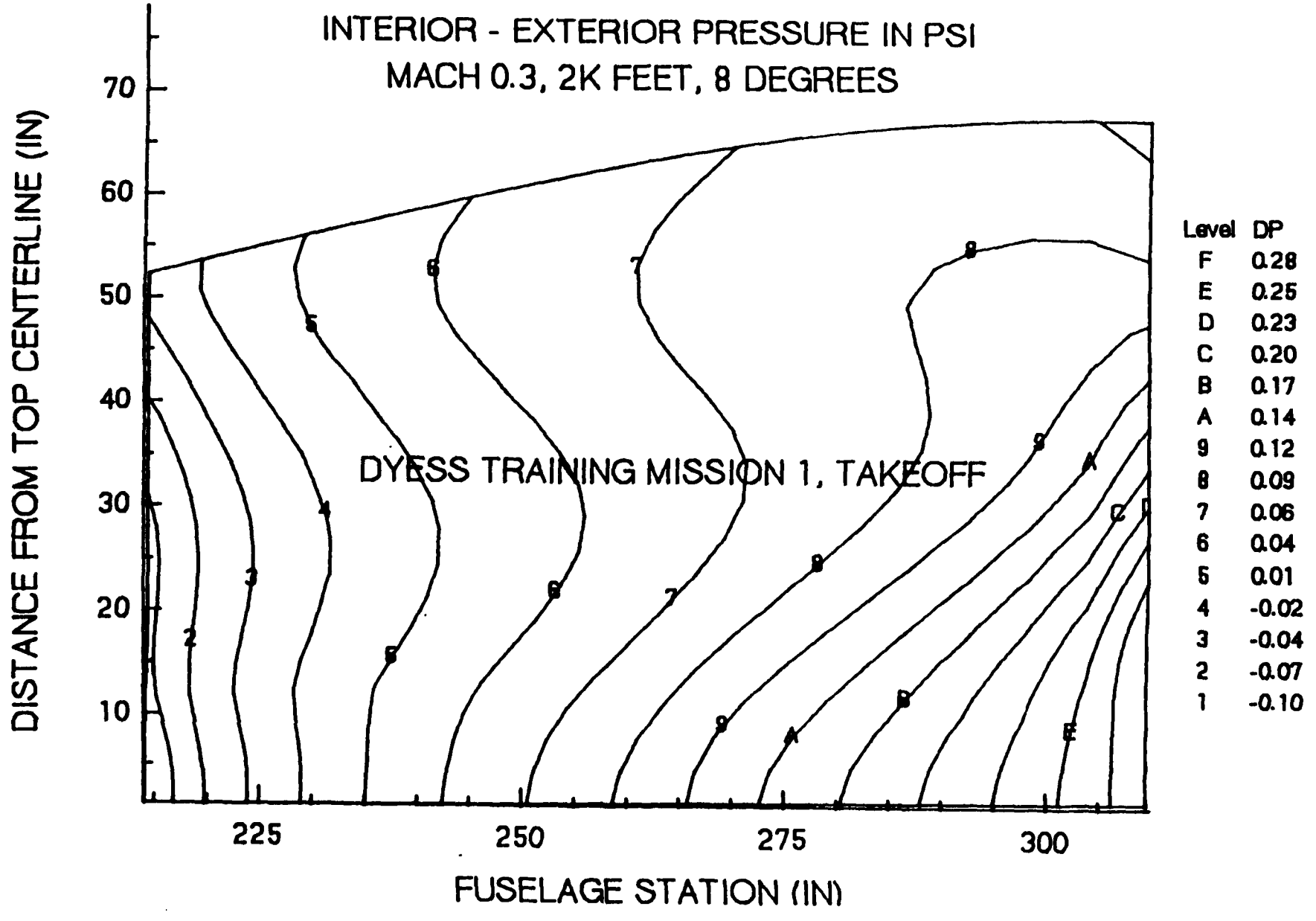
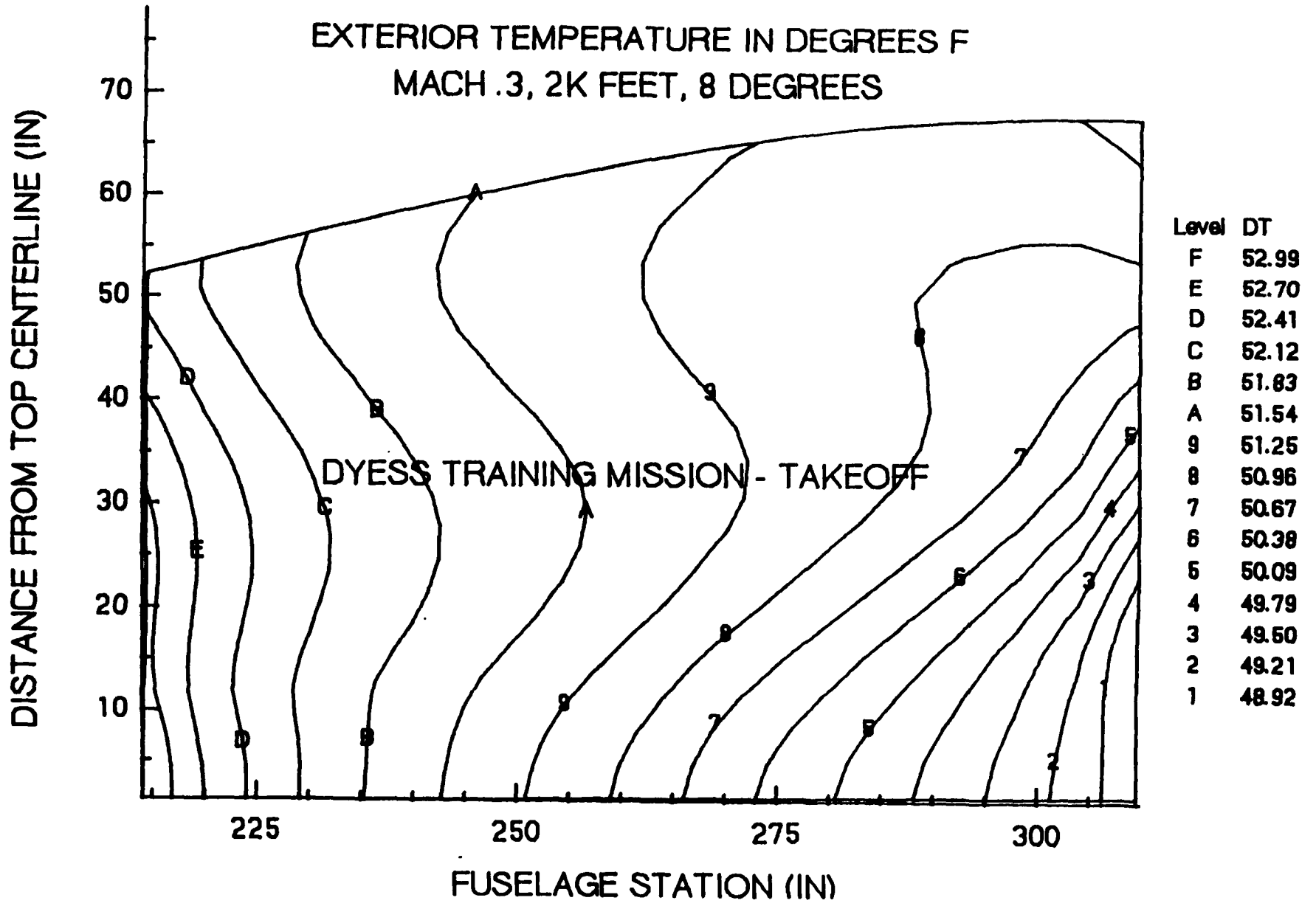
APPENDIX A

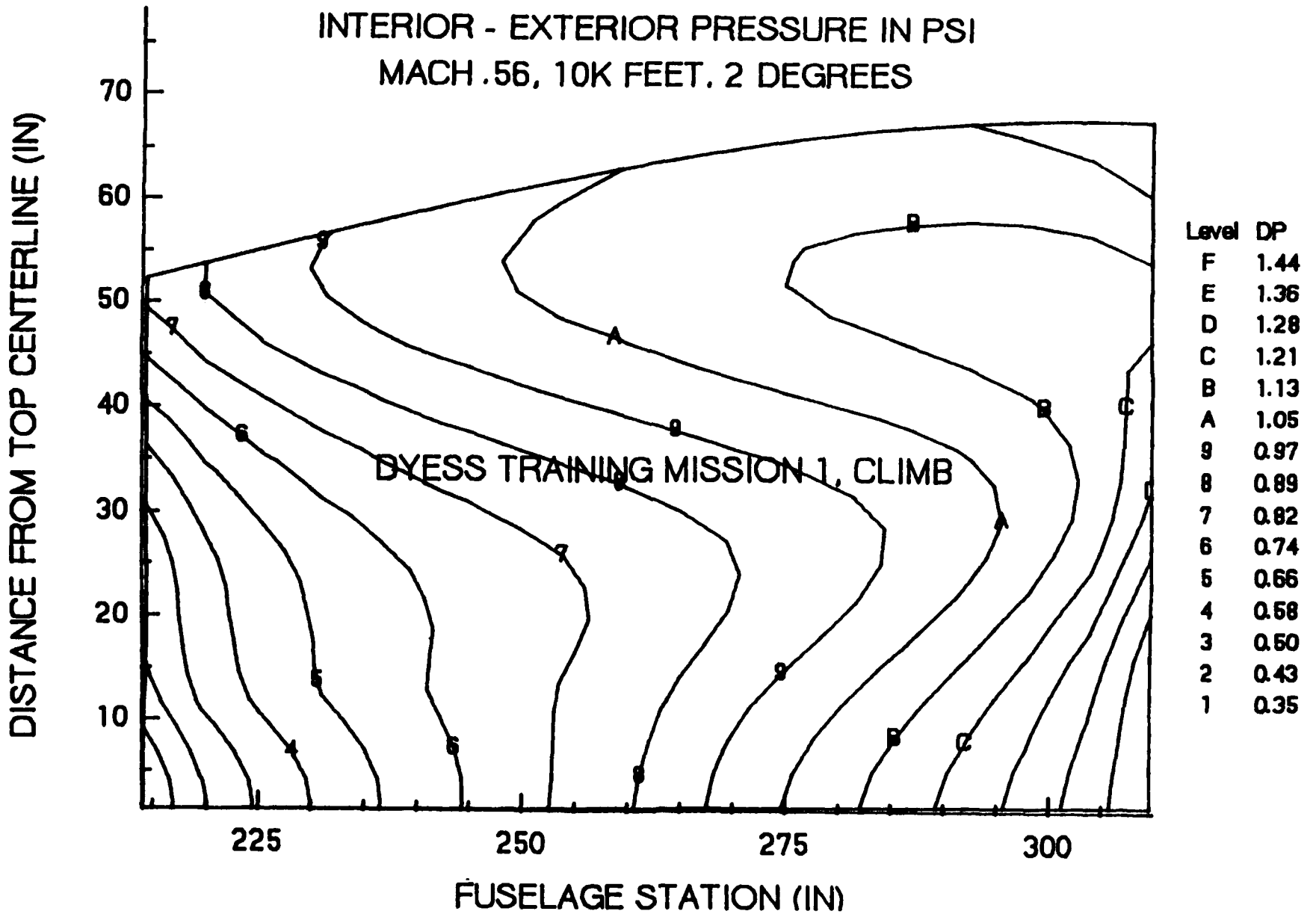
DYESS TRAINING MISSION 1

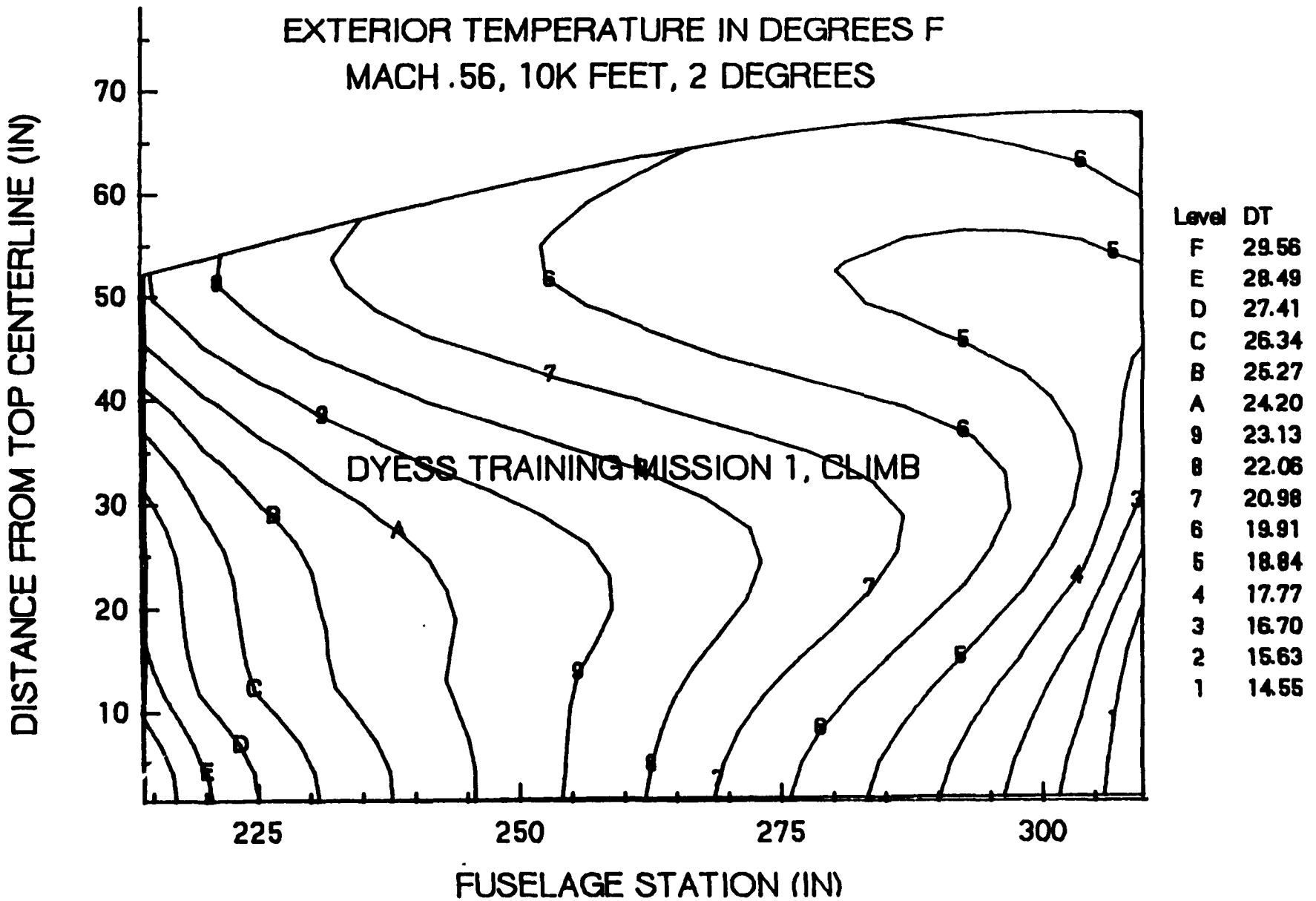
DYESS TRAINING MISSION #1

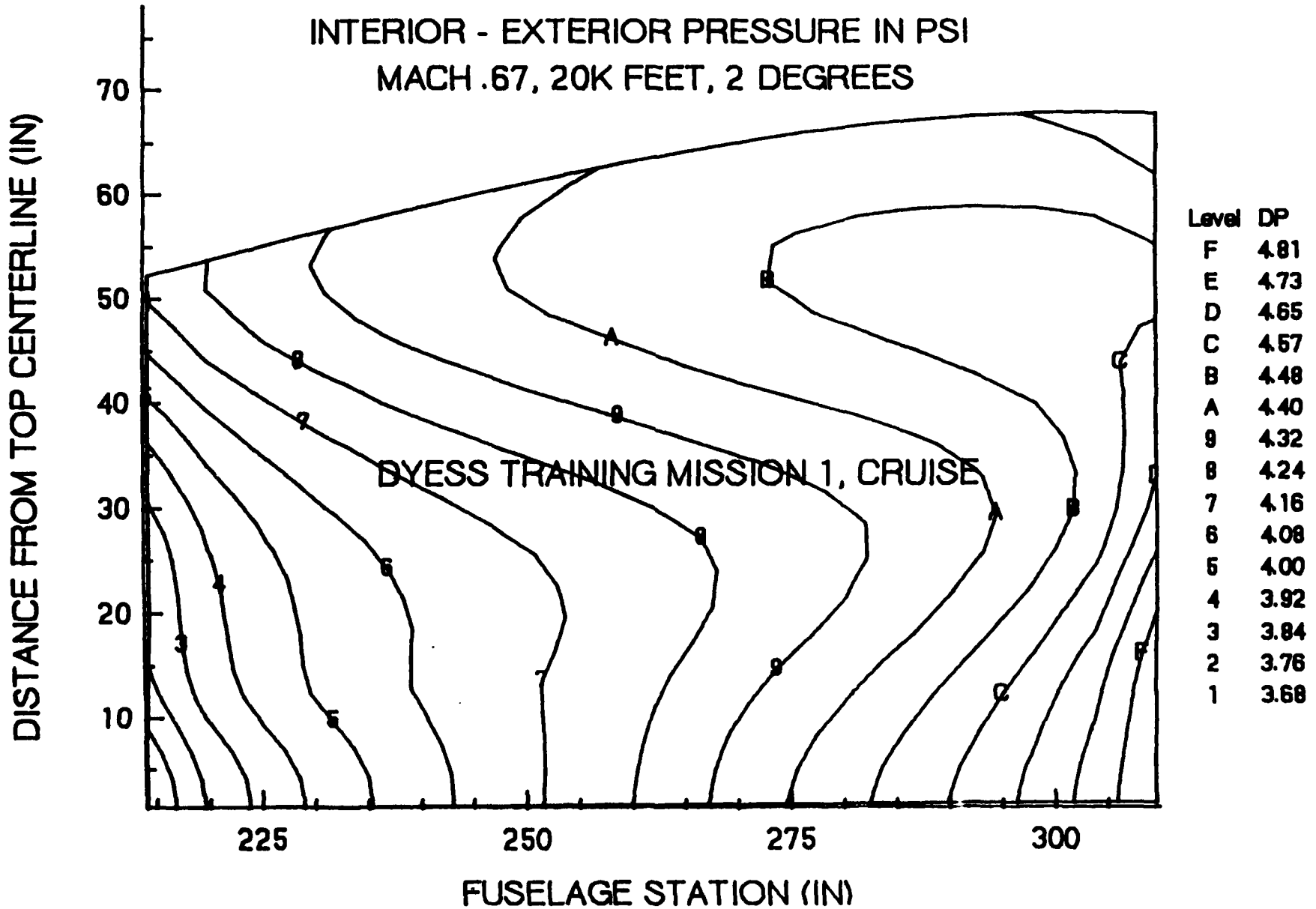
LEG	WING SWEEP (DEGREES)	MACH	ALTITUDE (1000 FT)	ALPHA (DEG)
TAKEOFF	20	.3	2	8
CLIMB	25	.56	10	2
CRUISE	25	.67	20	2
CRUISE	25	.72	20	1.3
DESCEND	67.5	.85	9	3
TERRAIN FOLLOW	67.5	.85	8	2
CLIMB/CRUISE	25	.72	16	.7
DESCEND	67.5	.85	9	3
TERRAIN FOLLOW	67.5	.85	8	1.6
CLIMB/CRUISE	25	.72	13	.5
JET PENETRATION	25	.72	2	4
TOUCH & GO/LAND	20	.3	2	7

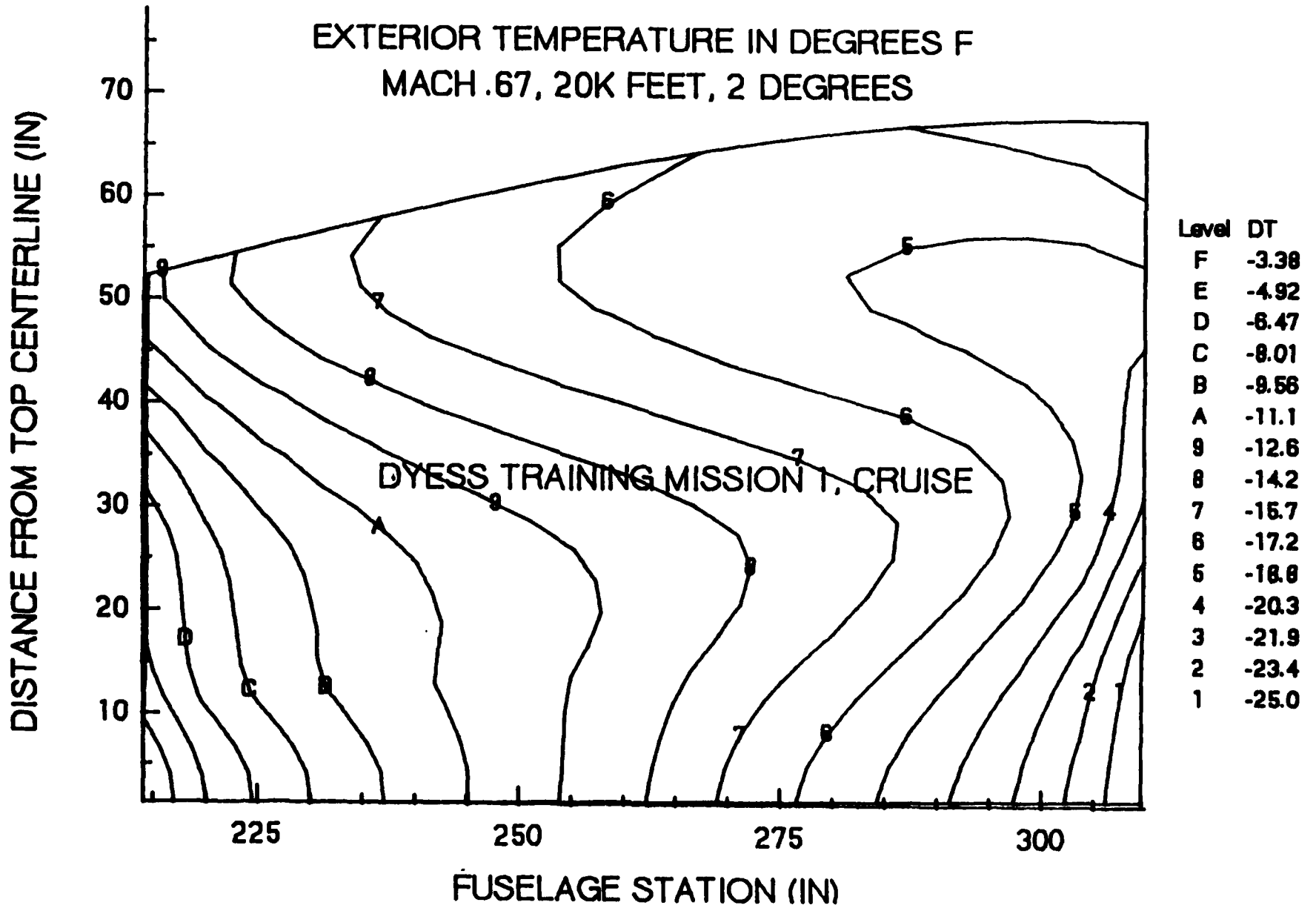

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH 0.3, 2K FEET, 8 DEGREES
DYESS TRAINING MISSION 1, TAKEOFF
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 0.28
E 0.25
D 0.23
C 0.20
B 0.17
A 0.14
9 0.12
8 0.09
7 0.06
6 0.04
5 0.01
4 -0.02
3 -0.04
2 -0.07
1 -0.10

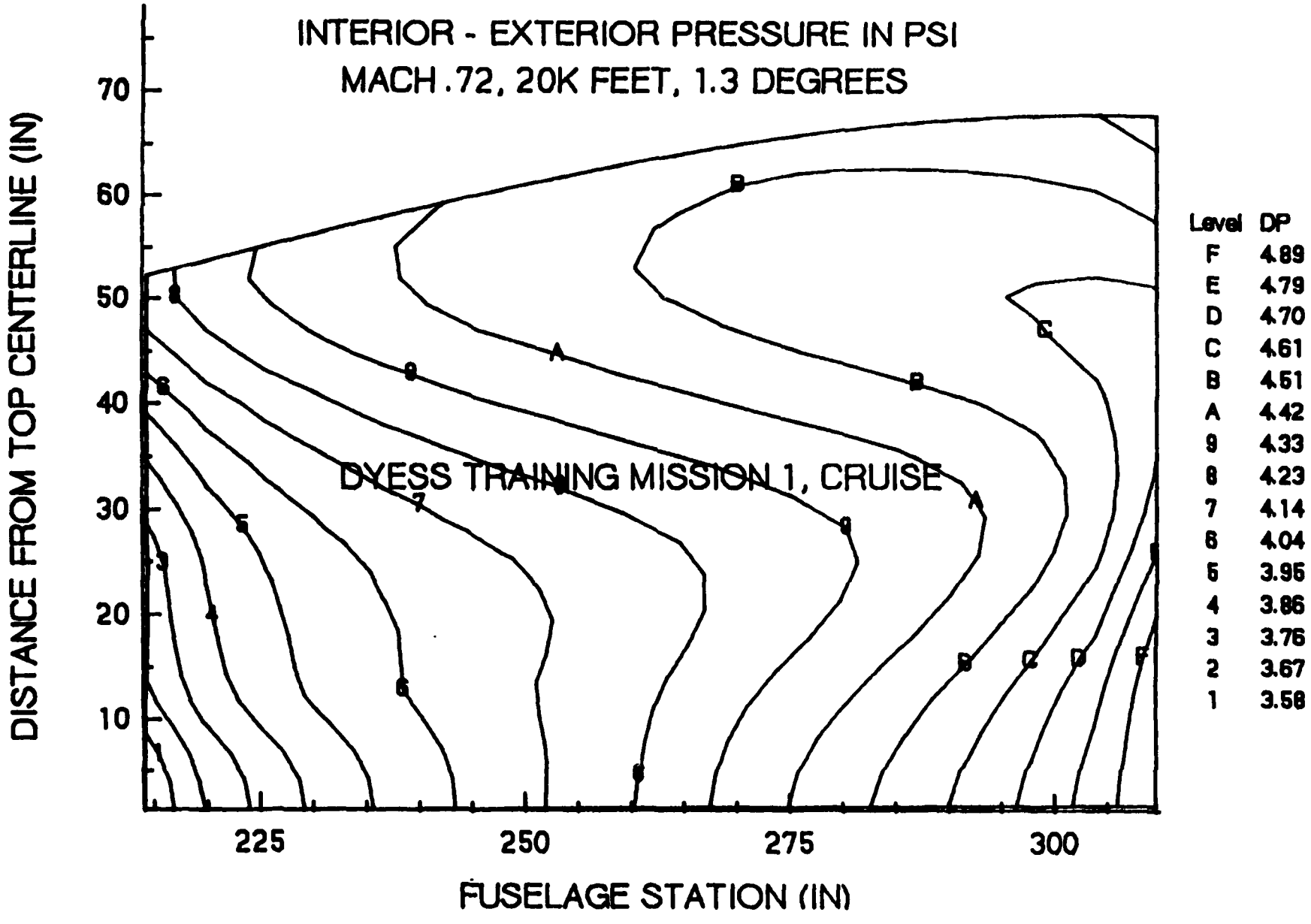

EXTERIOR TEMPERATURE IN DEGREES F
MACH .3, 2K FEET, 8 DEGREES
DYESS TRAINING MISSION - TAKEOFF
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 52.99
E 52.70
D 52.41
C 52.12
B 51.83
A 51.54
9 51.25
8 50.96
7 50.67
6 50.38
5 50.09
4 49.79
3 49.50
2 49.21
1 48.92

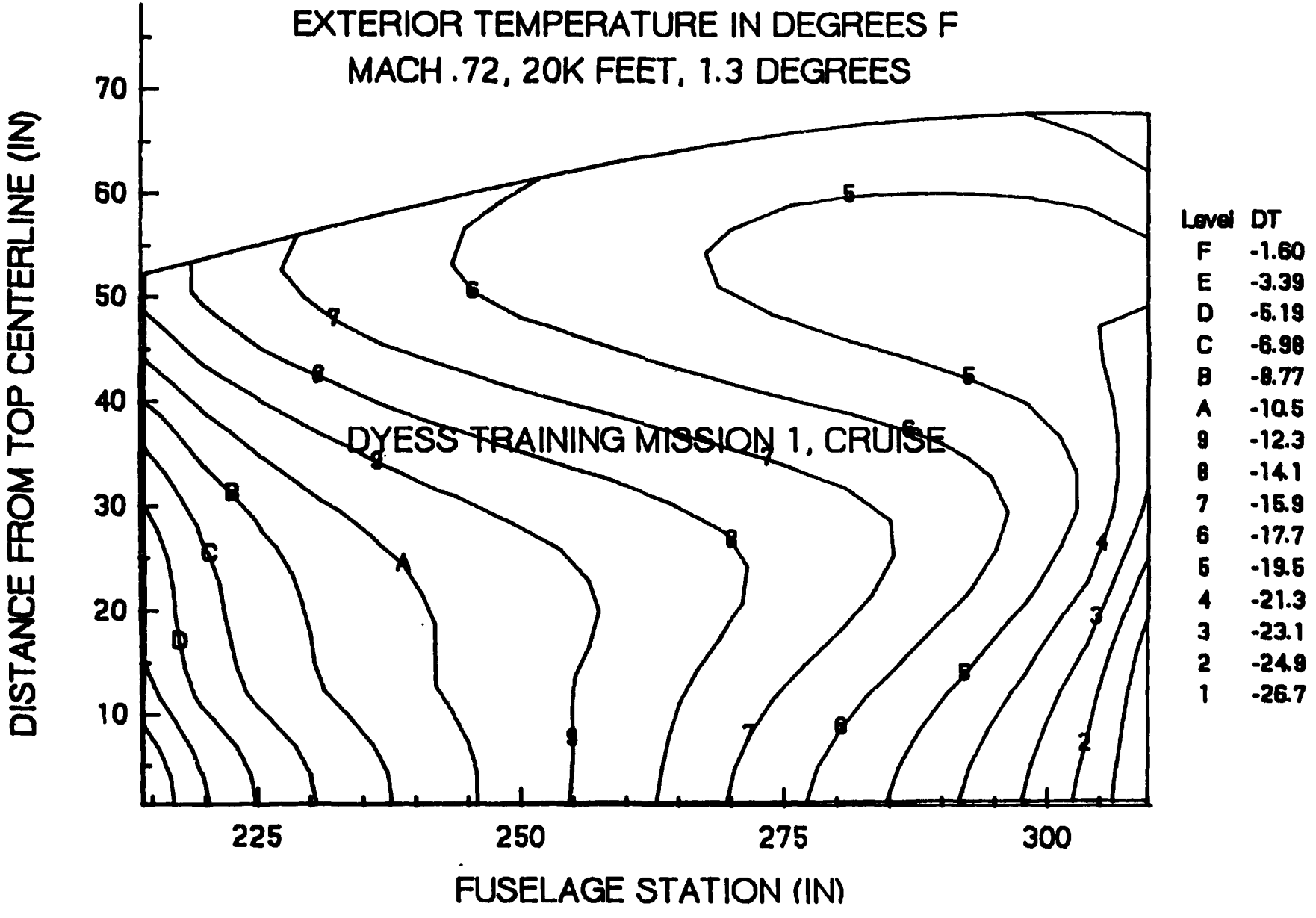

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .56, 10K FEET, 2 DEGREES
DYESS TRAINING MISSION 1, CLIMB
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 1.44
E 1.36
D 1.28
C 1.21
B 1.13
A 1.05
9 0.97
8 0.89
7 0.82
6 0.74
5 0.66
4 0.58
3 0.50
2 0.43
1 0.35

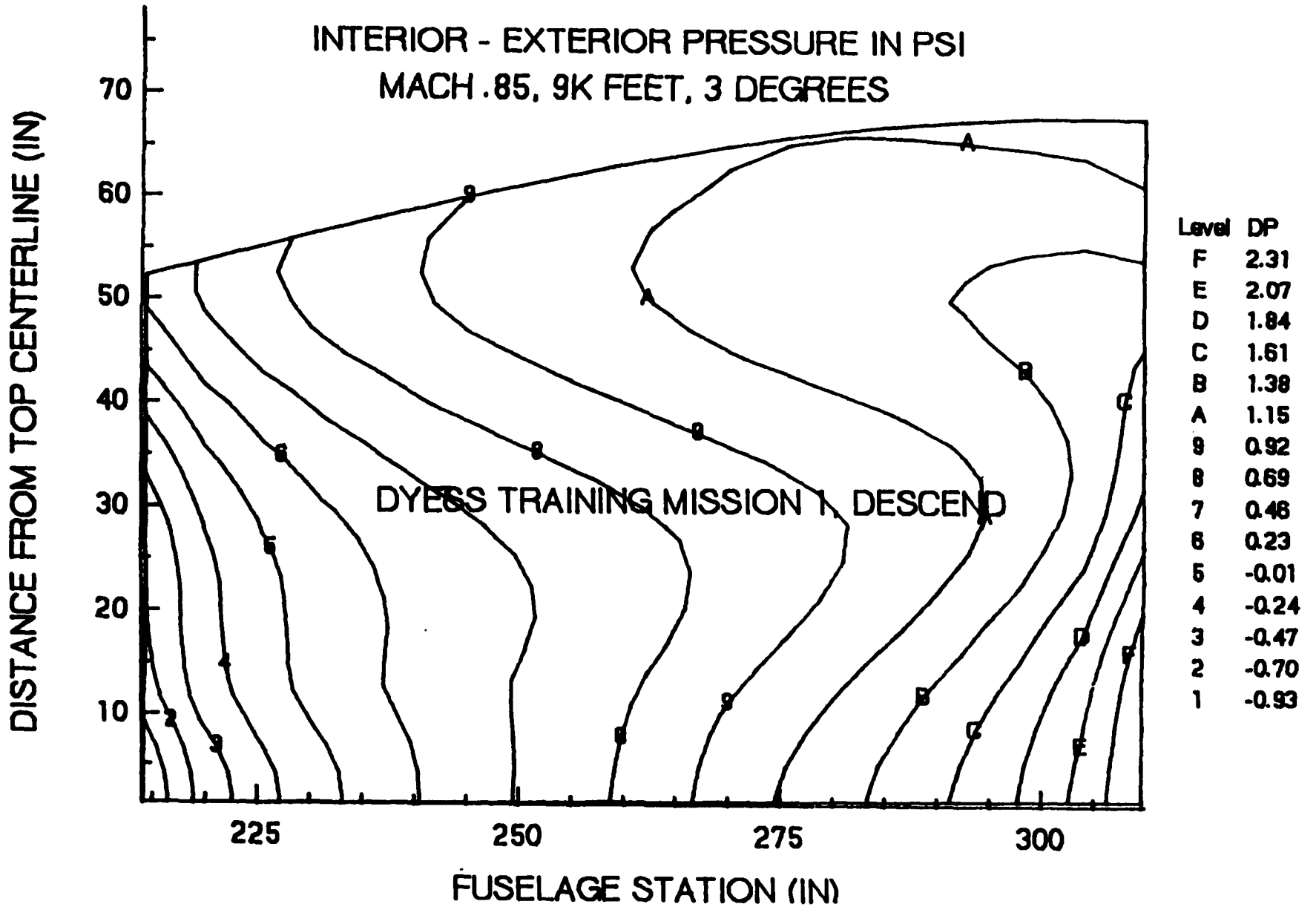

EXTERIOR TEMPERATURE IN DEGREES F
MACH .56, 10K FEET, 2 DEGREES
DYESS TRAINING MISSION 1, CLIMB
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 29.56
E 28.49
D 27.41
C 26.34
B 25.27
A 24.20
9 23.13
8 22.06
7 20.98
6 19.91
5 18.84
4 17.77
3 16.70
2 15.63
1 14.55

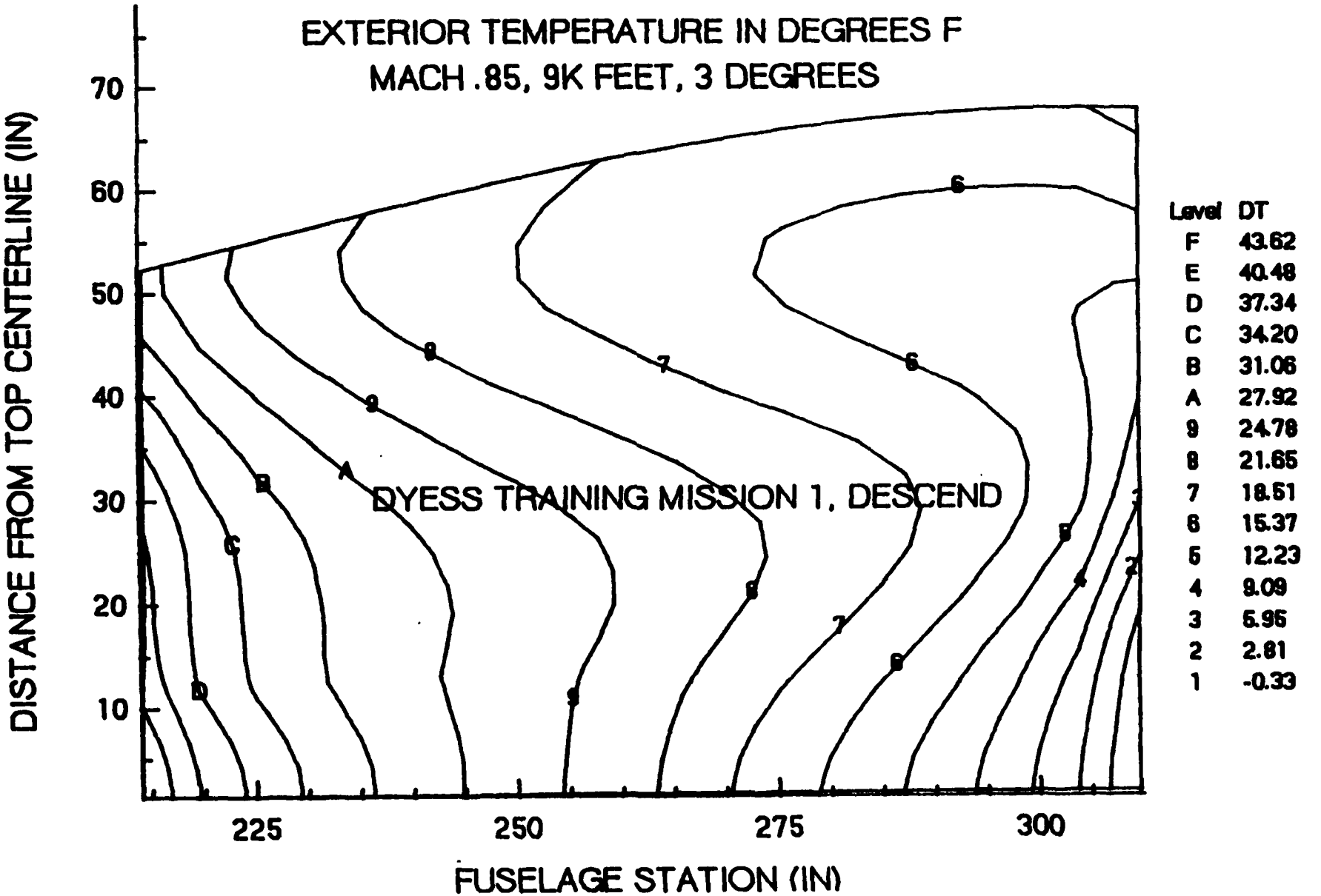

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .67, 20K FEET, 2 DEGREES
DYESS TRAINING MISSION 1, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.81
E 4.73
D 4.65
C 4.57
B 4.48
A 4.40
9 4.32
8 4.24
7 4.16
6 4.08
5 4.00
4 3.92
3 3.84
2 3.76
1 3.68

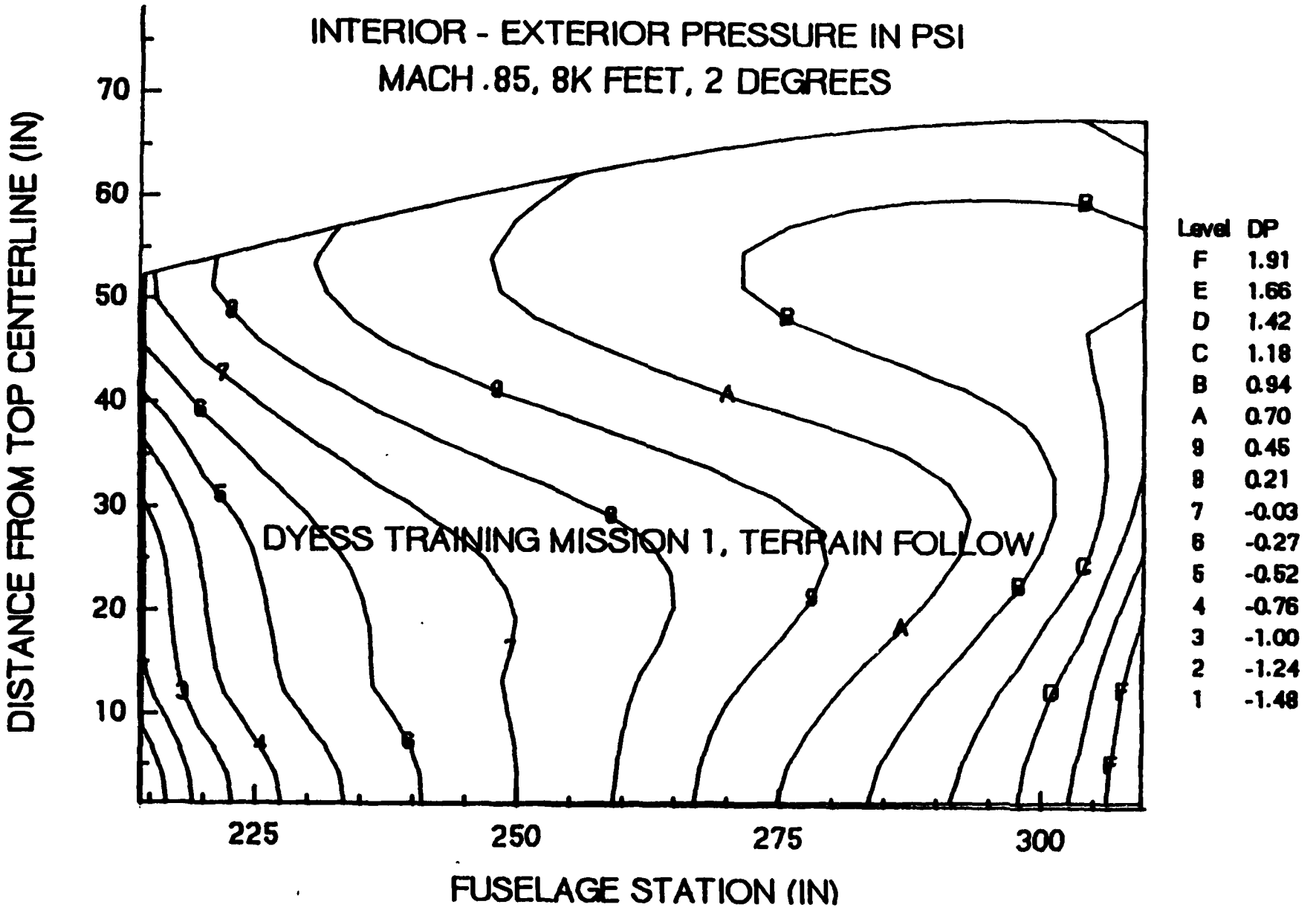

EXTERIOR TEMPERATURE IN DEGREES F
MACH .67, 20K FEET, 2 DEGREES
DYESS TRAINING MISSION 1, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F -3.38
E -4.92
D -6.47
C -8.01
B -9.56
A -11.1
9 -12.6
8 -14.2
7 -15.7
6 -17.2
5 -18.8
4 -20.3
3 -21.9
2 -23.4
1 -25.0

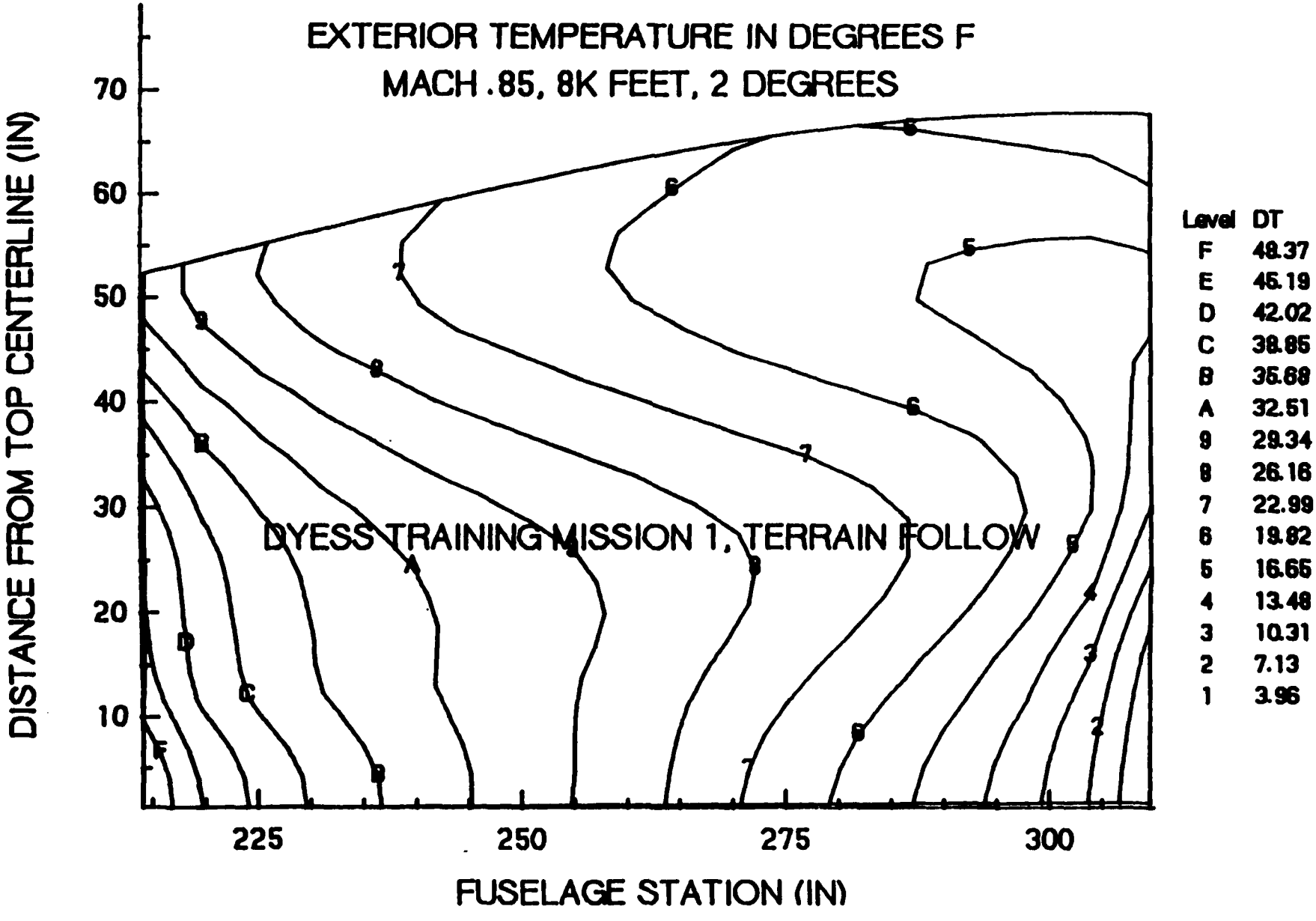

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 20K FEET, 1.3 DEGREES
DYESS TRAINING MISSION 1, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.89
E 4.79
D 4.70
C 4.61
B 4.51
A 4.42
9 4.33
8 4.23
7 4.14
6 4.04
5 3.95
4 3.86
3 3.76
2 3.67
1 3.58

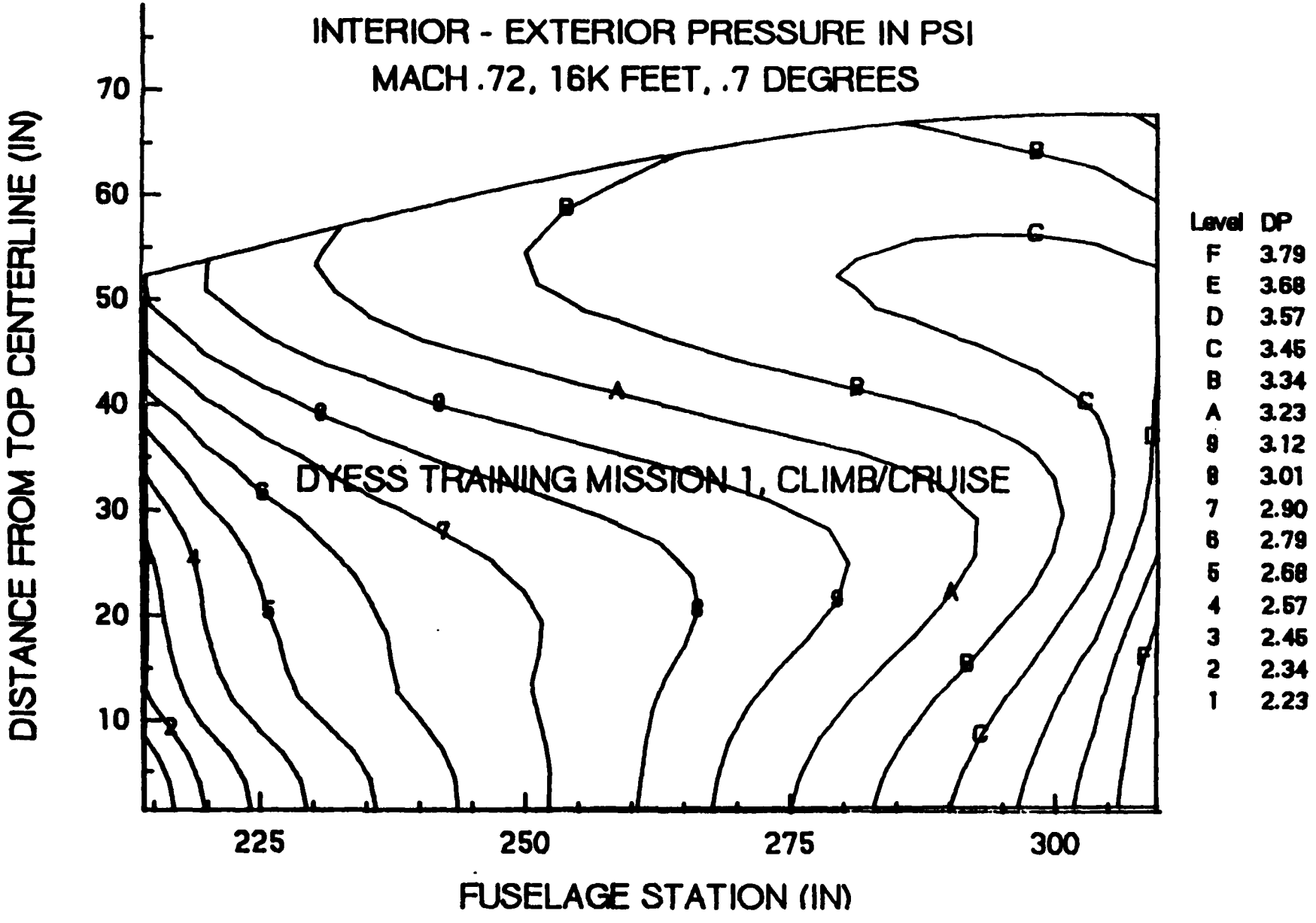

EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 20K FEET, 1.3 DEGREES
DYESS TRAINING MISSION 1, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F -1.60
E -3.39
D -5.19
C -6.98
B -8.77
A -10.5
9 -12.3
8 -14.1
7 -15.9
6 -17.7
5 -19.5
4 -21.3
3 -23.1
2 -24.9
1 -26.7


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .85, 9K FEET, 3 DEGREES
DYESS TRAINING MISSION 1, DESCEND
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 2.31
E 2.07
D 1.84
C 1.61
B 1.38
A 1.15
9 0.92
8 0.69
7 0.46
6 0.23
5 -0.01
4 -0.24
3 -0.47
2 -0.70
1 -0.93


EXTERIOR TEMPERATURE IN DEGREES F
MACH .85, 9K FEET, 3 DEGREES
DYESS TRAINING MISSION 1, DESCEND
DISTANCE FROM TOP CENTERLINE (IN)
FUSELAGE STATION (IN)
70
60
50
40
30
20
10
225
250
275
300
Level DT
F 43.62
E 40.48
D 37.34
C 34.20
B 31.06
A 27.92
9 24.78
8 21.65
7 18.51
6 15.37
5 12.23
4 9.09
3 5.95
2 2.81
1 -0.33


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .85, 8K FEET, 2 DEGREES
DYESS TRAINING MISSION 1, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 1.91
E 1.66
D 1.42
C 1.18
B 0.94
A 0.70
9 0.45
8 0.21
7 -0.03
6 -0.27
5 -0.52
4 -0.76
3 -1.00
2 -1.24
1 -1.48


EXTERIOR TEMPERATURE IN DEGREES F
MACH .85, 8K FEET, 2 DEGREES
DYESS TRAINING MISSION 1, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 48.37
E 45.19
D 42.02
C 38.85
B 35.68
A 32.51
9 29.34
8 26.16
7 22.99
6 19.82
5 16.65
4 13.48
3 10.31
2 7.13
1 3.96


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 16K FEET, .7 DEGREES
DYESS TRAINING MISSION 1, CLIMB/CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 3.79
E 3.68
D 3.57
C 3.46
B 3.34
A 3.23
9 3.12
8 3.01
7 2.90
6 2.79
5 2.68
4 2.67
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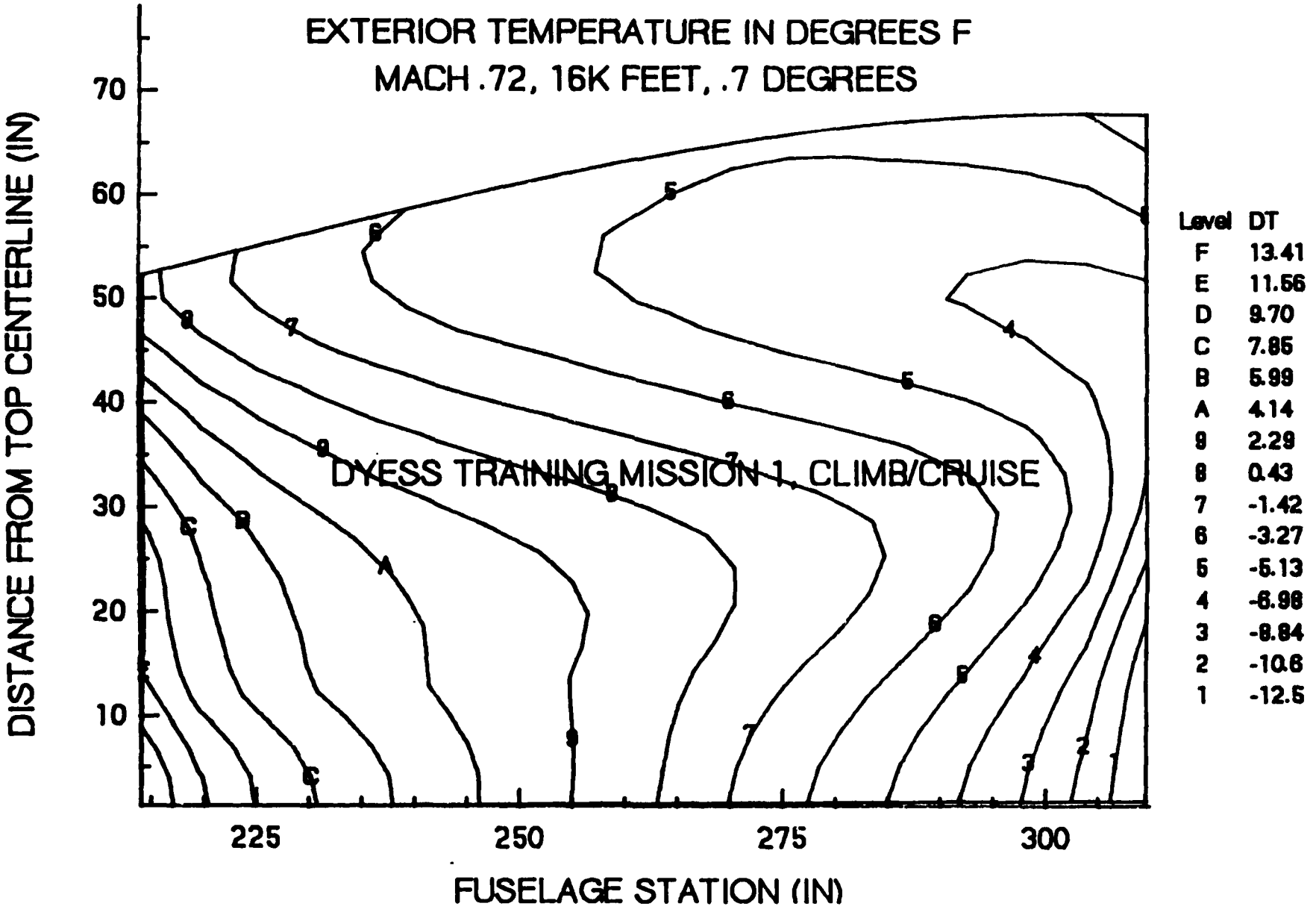
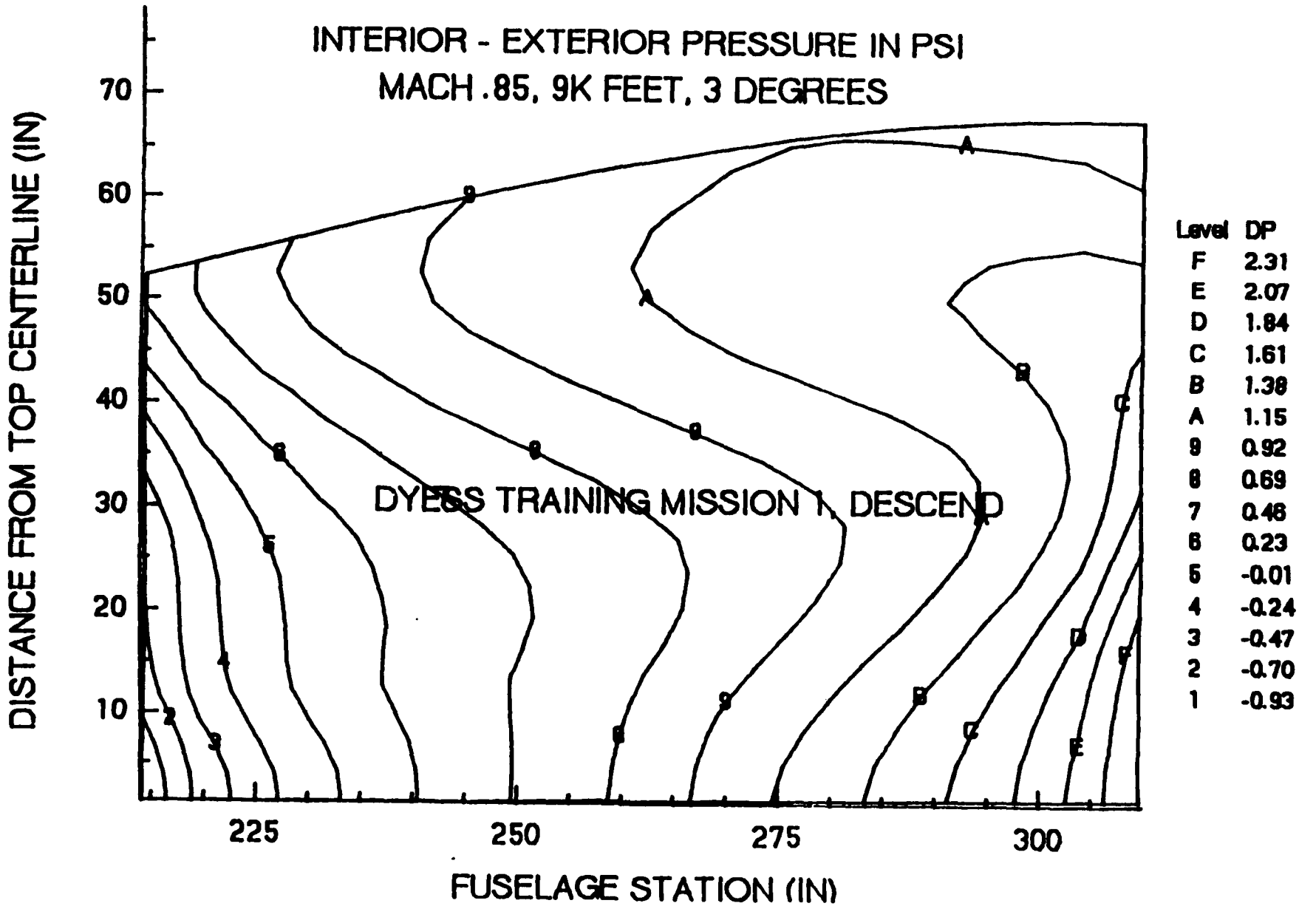
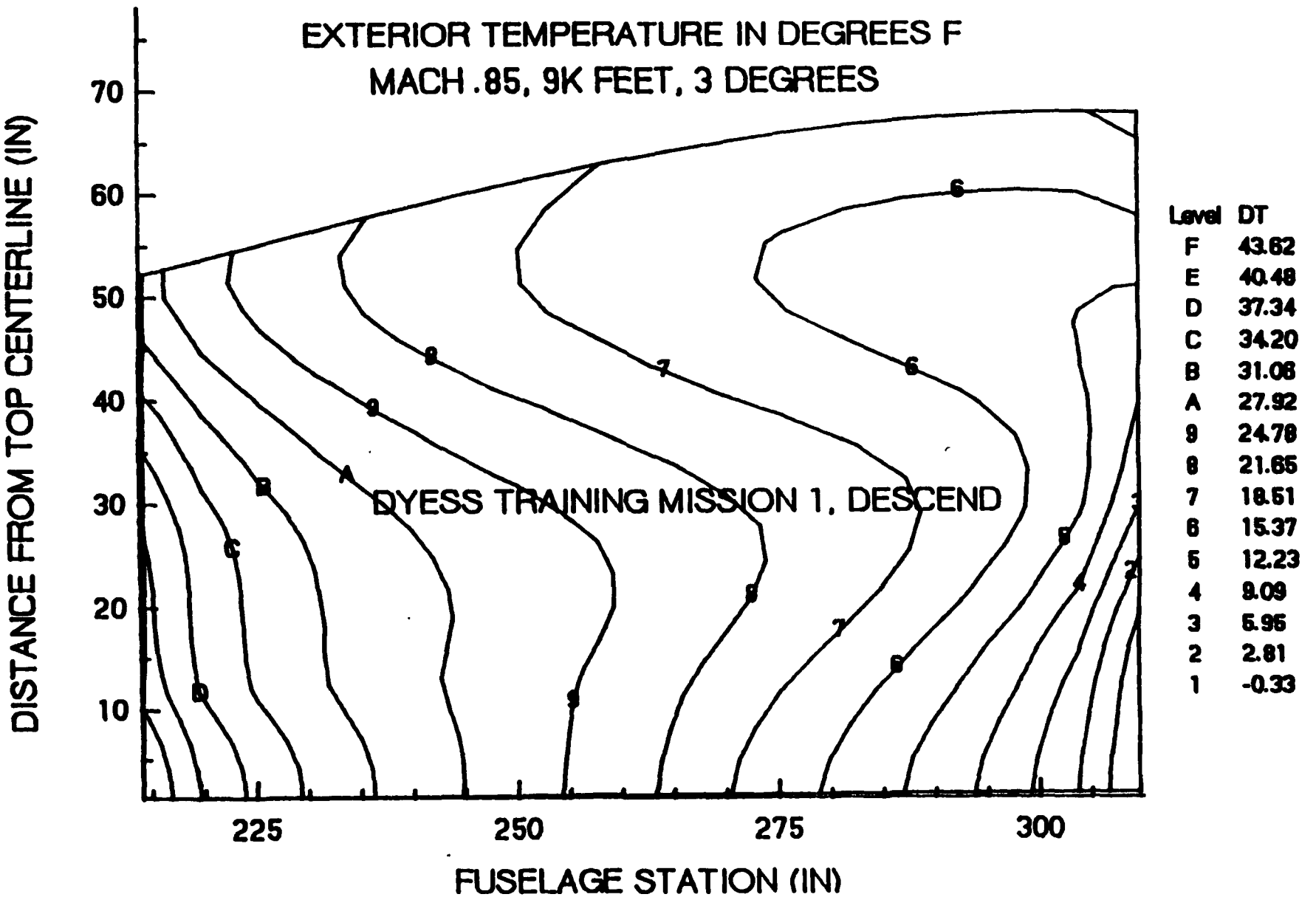
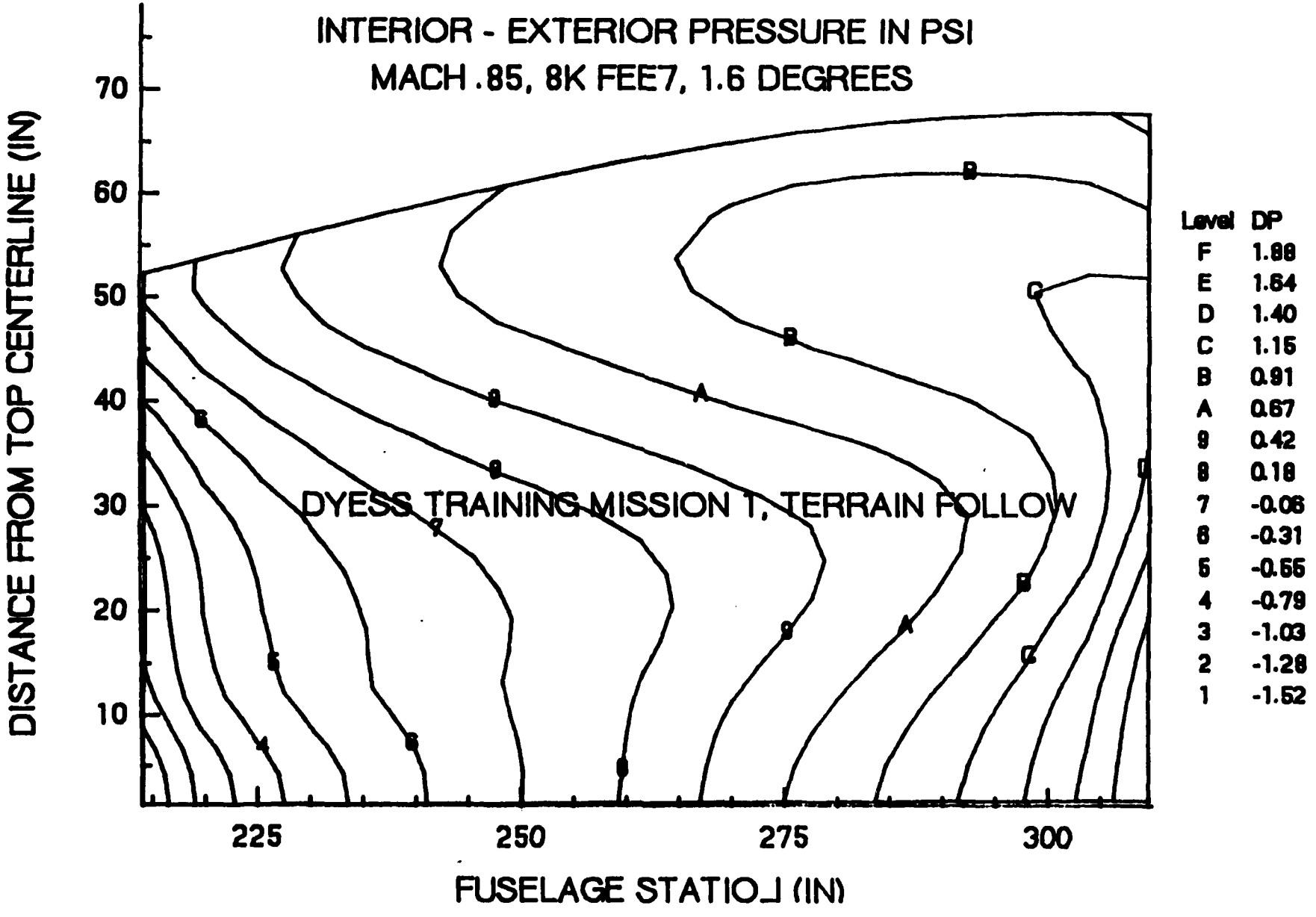
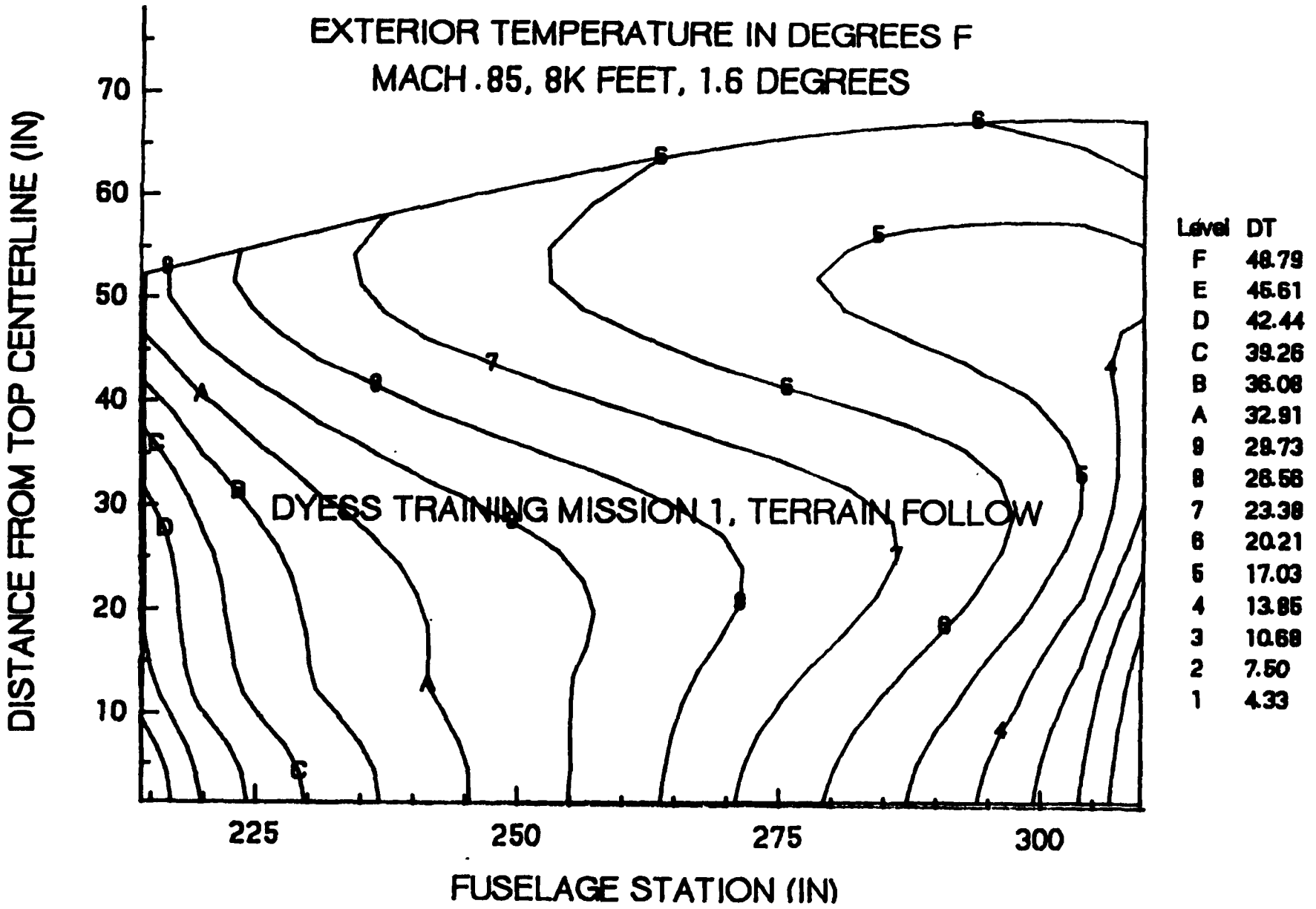
2 2.34
1 2.23

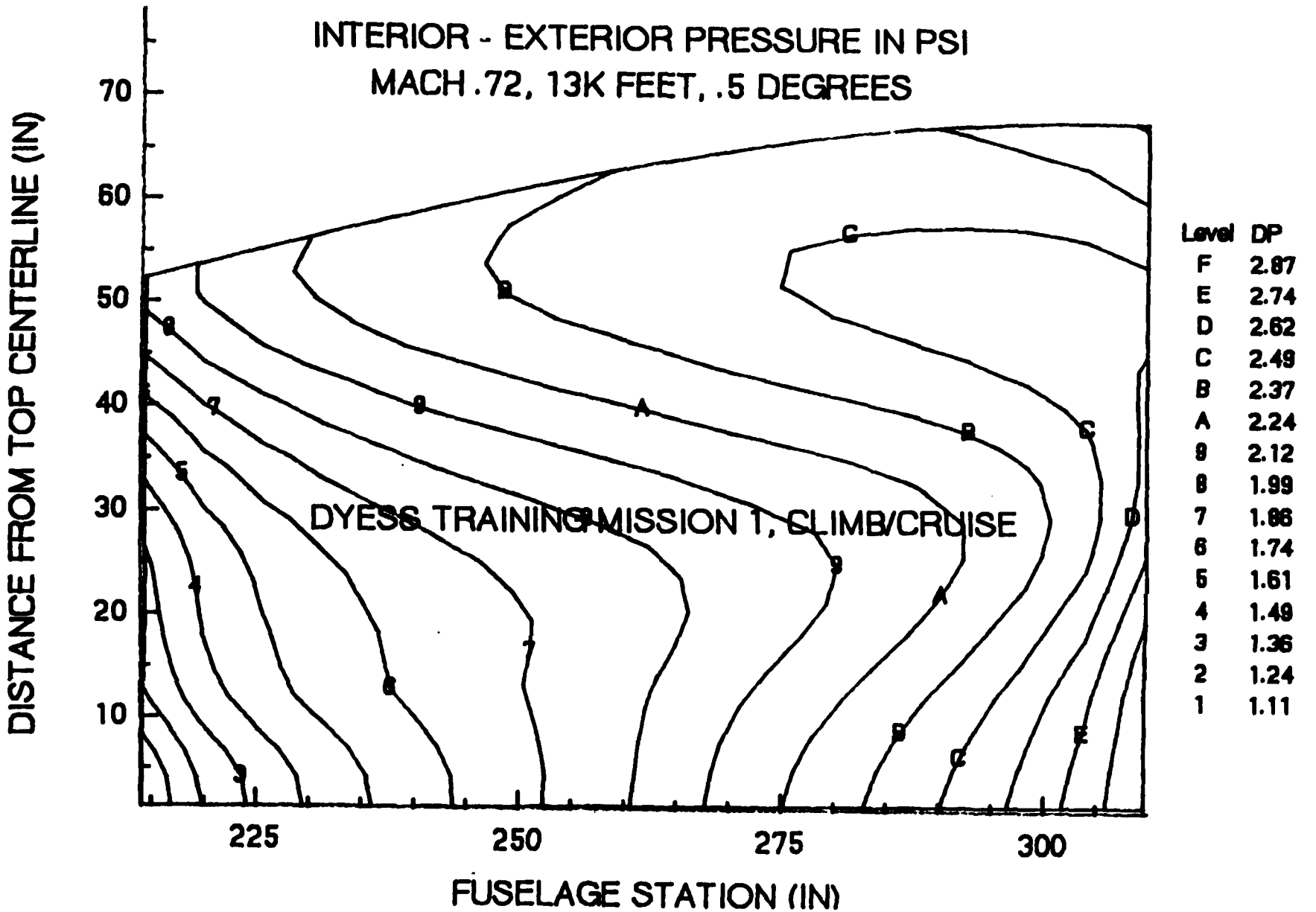

EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 16K FEET, .7 DEGREES
DYESS TRAINING MISSION 1, CLIMB/CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 13.41
E 11.56
D 9.70
C 7.85
B 5.99
A 4.14
9 2.29
8 0.43
7 -1.42
6 -3.27
5 -5.13
4 -6.98
3 -8.84
2 -10.6
1 -12.5

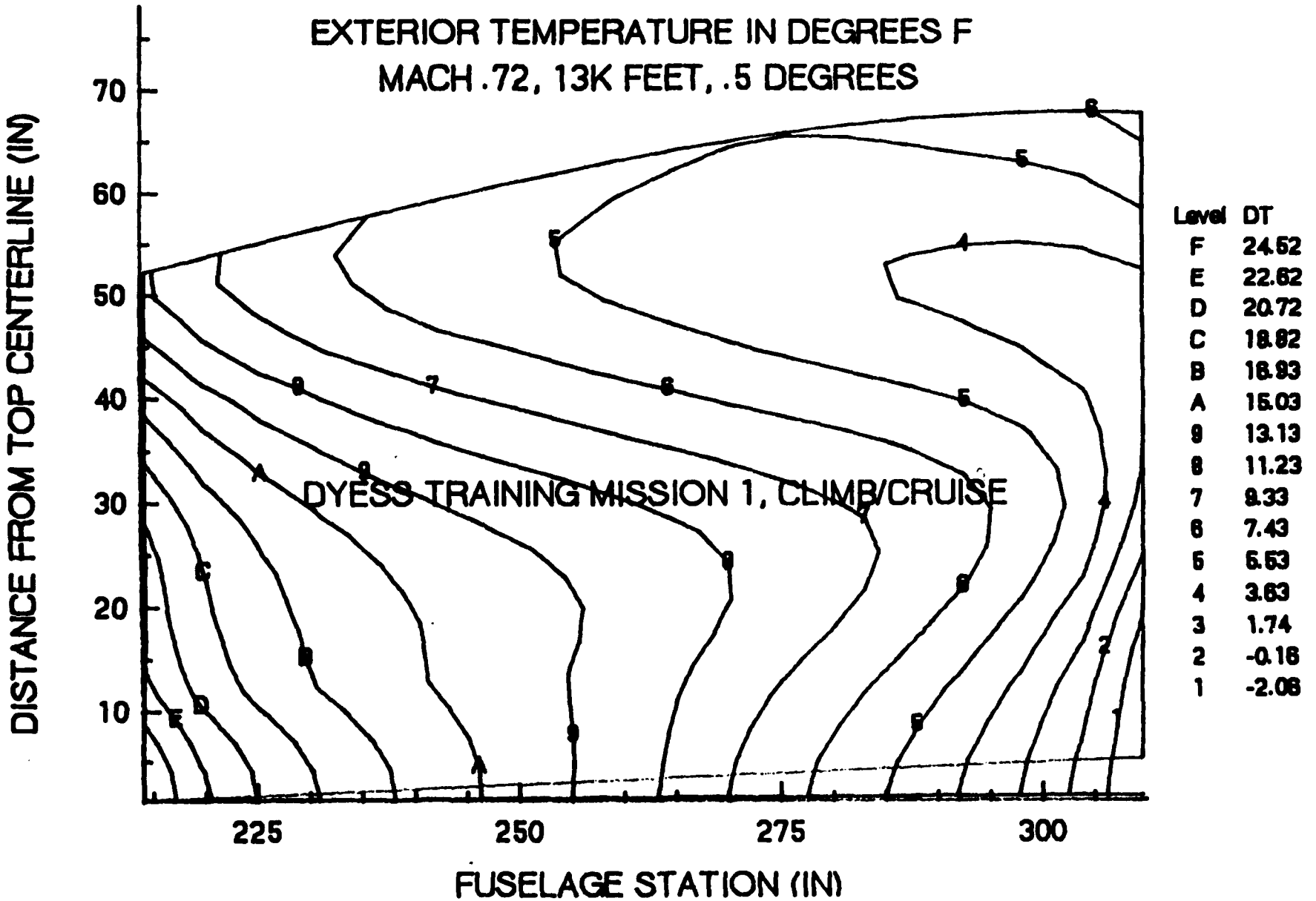

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .85, 9K FEET, 3 DEGREES
DYESS TRAINING MISSION 1, DESCEND
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 2.31
E 2.07
D 1.84
C 1.61
B 1.38
A 1.15
9 0.92
8 0.69
7 0.46
6 0.23
5 -0.01
4 -0.24
3 -0.47
2 -0.70
1 -0.93

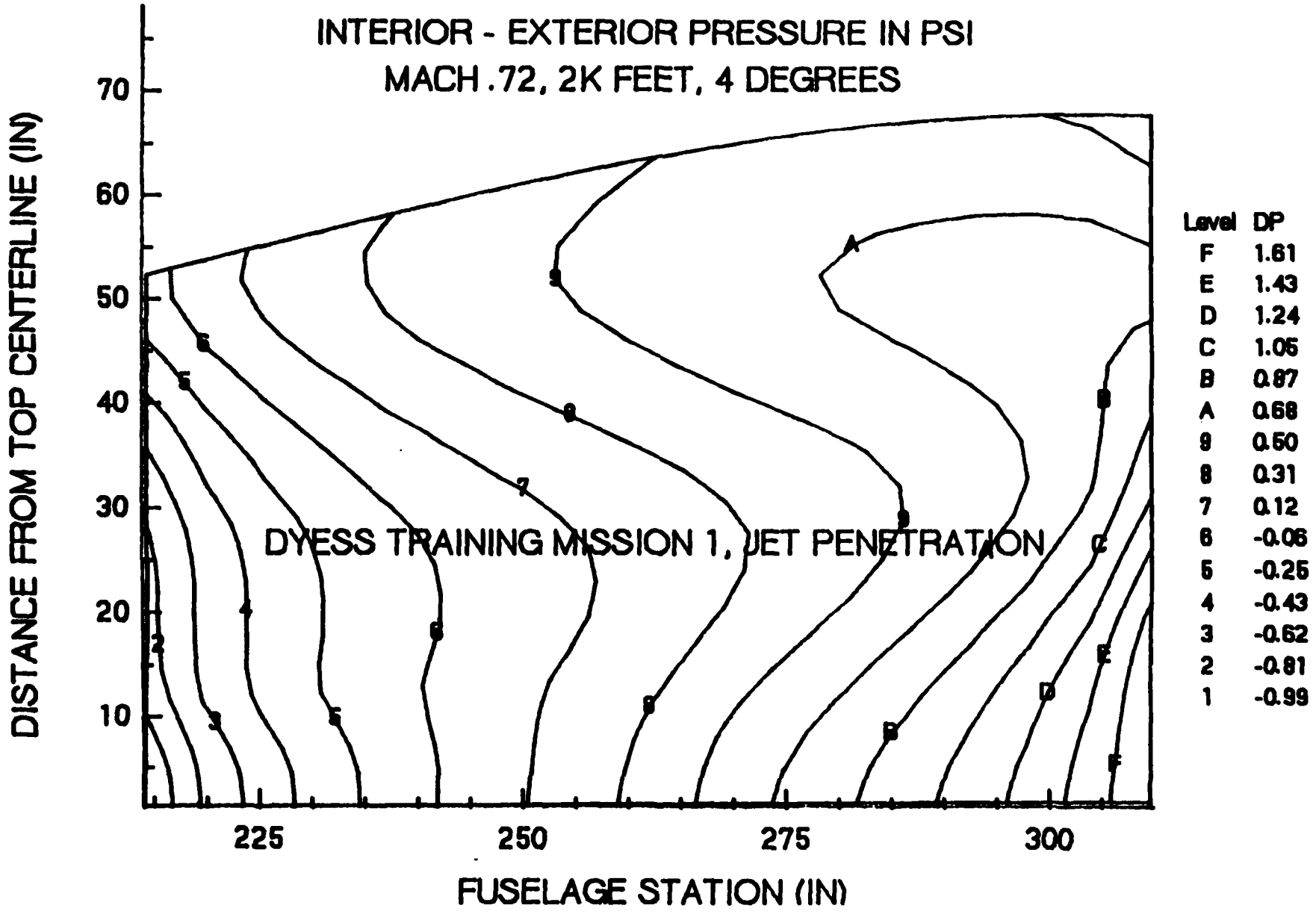

EXTERIOR TEMPERATURE IN DEGREES F
MACH .85, 9K FEET, 3 DEGREES
DYESS TRAINING MISSION 1, DESCEND
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 43.62
E 40.48
D 37.34
C 34.20
B 31.06
A 27.92
9 24.78
8 21.65
7 18.51
6 15.37
5 12.23
4 9.09
3 5.96
2 2.81
1 -0.33

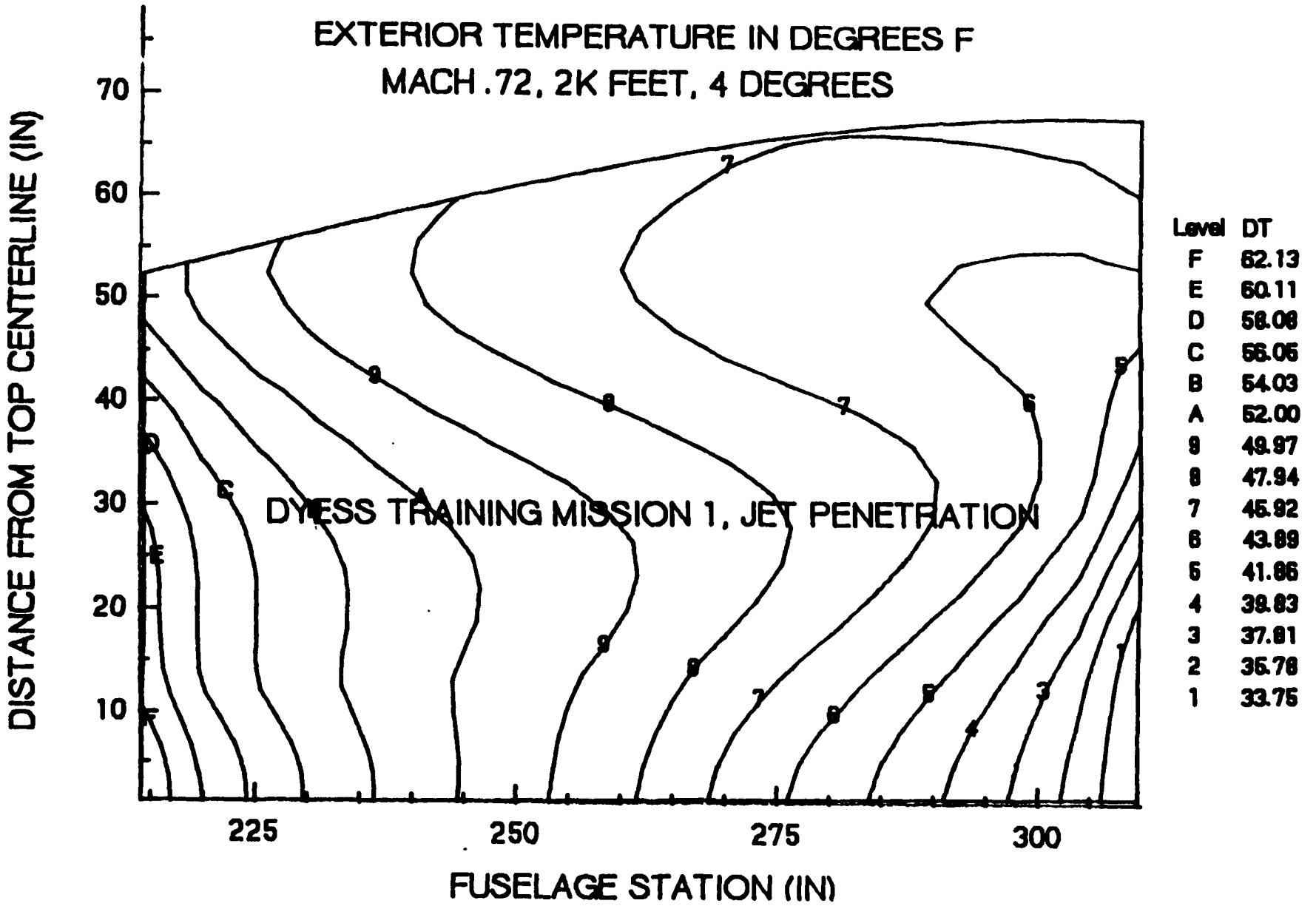

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .85, 8K FEE7, 1.6 DEGREES
DYESS TRAINING MISSION 1, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATIO_I (IN)
Level DP
F 1.88
E 1.64
D 1.40
C 1.15
B 0.91
A 0.67
9 0.42
8 0.18
7 -0.06
6 -0.31
5 -0.55
4 -0.79
3 -1.03
2 -1.28
1 -1.52

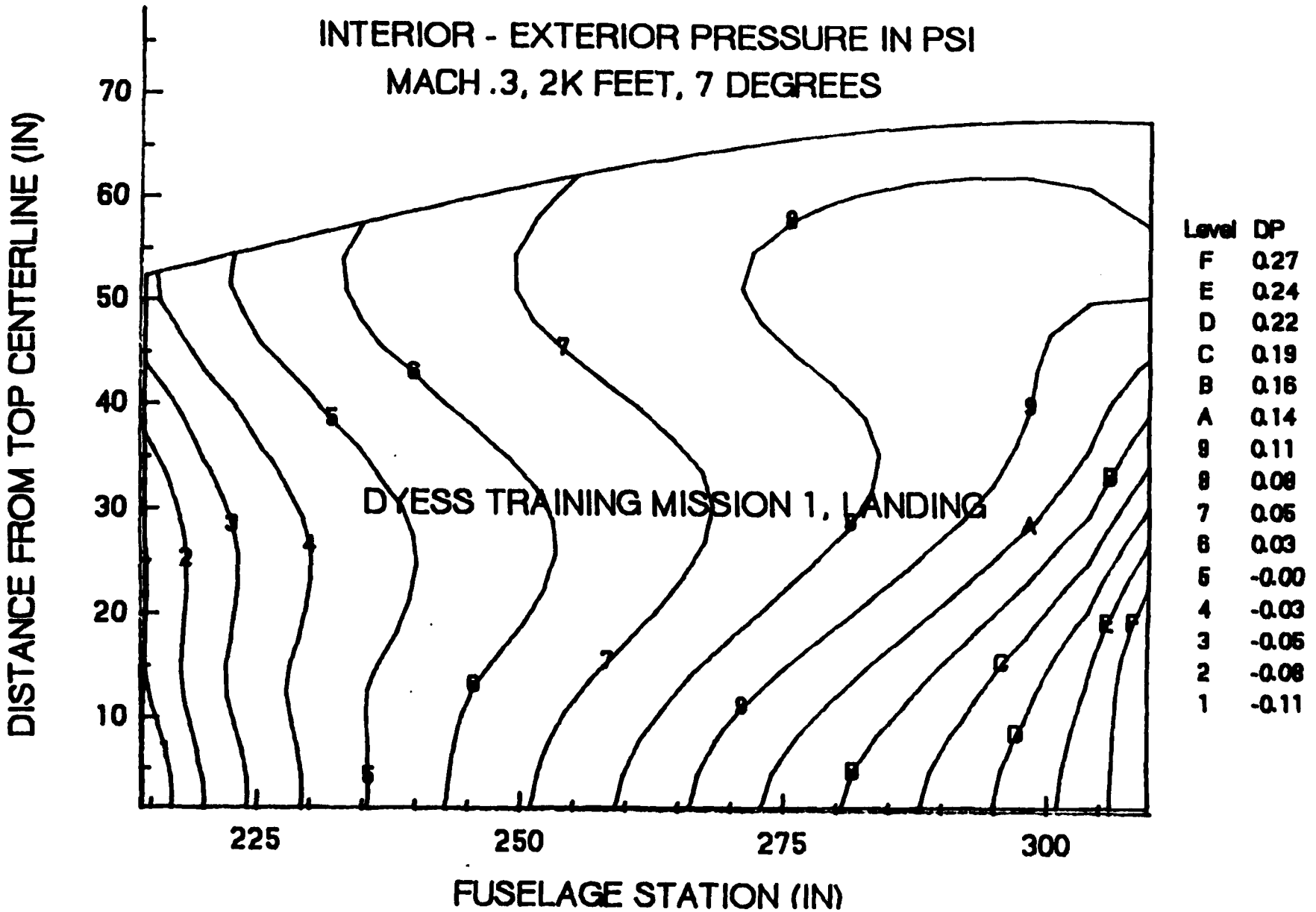

EXTERIOR TEMPERATURE IN DEGREES F
MACH .85, 8K FEET, 1.6 DEGREES
DYESS TRAINING MISSION 1, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 48.79
E 45.61
D 42.44
C 39.26
B 36.08
A 32.91
9 29.73
8 26.56
7 23.38
6 20.21
5 17.03
4 13.85
3 10.68
2 7.50
1 4.33

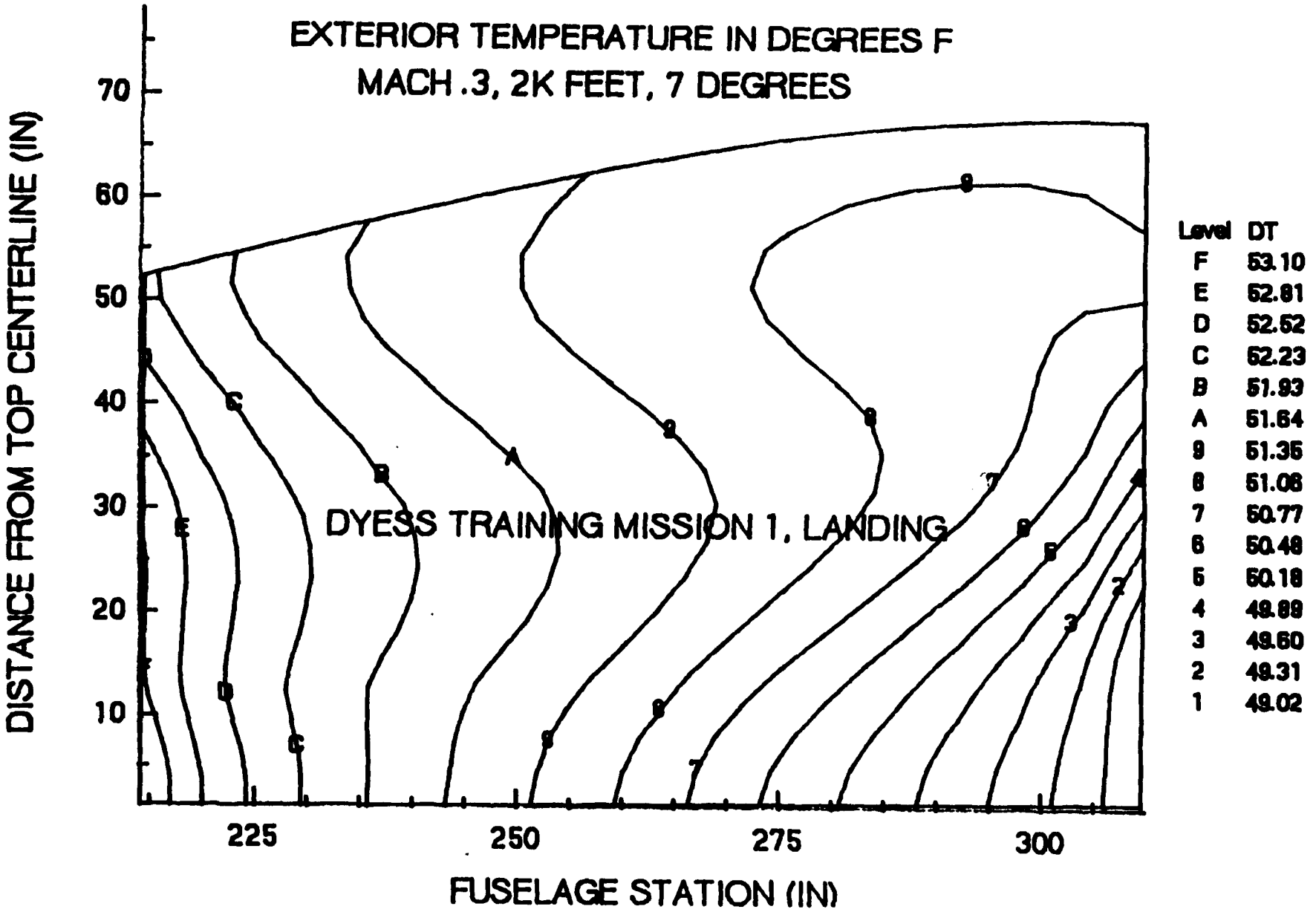

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 13K FEET, .5 DEGREES
DYESS TRAINING MISSION 1, CLIMB/CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 2.87
E 2.74
D 2.62
C 2.49
B 2.37
A 2.24
9 2.12
8 1.99
7 1.86
6 1.74
5 1.61
4 1.49
3 1.36
2 1.24
1 1.11


EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 13K FEET, .5 DEGREES
DYESS TRAINING MISSION 1, CLIMB/CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 24.52
E 22.62
D 20.72
C 18.82
B 16.93
A 15.03
9 13.13
8 11.23
7 9.33
6 7.43
5 5.53
4 3.63
3 1.74
2 -0.16
1 -2.06


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 2K FEET, 4 DEGREES
DYESS TRAINING MISSION 1, JET PENETRATION
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 1.61
E 1.43
D 1.24
C 1.06
B 0.87
A 0.68
9 0.50
8 0.31
7 0.12
6 -0.06
5 -0.25
4 -0.43
3 -0.62
2 -0.81
1 -0.99


EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 2K FEET, 4 DEGREES
DYESS TRAINING MISSION 1, JET PENETRATION
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 62.13
E 60.11
D 58.08
C 56.05
B 54.03
A 52.00
9 49.97
8 47.94
7 45.92
6 43.89
5 41.86
4 39.83
3 37.81
2 35.78
1 33.75


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .3, 2K FEET, 7 DEGREES
DYESS TRAINING MISSION 1, LANDING
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 0.27
E 0.24
D 0.22
C 0.19
B 0.16
A 0.14
9 0.11
8 0.08
7 0.05
6 0.03
5 -0.00
4 -0.03
3 -0.05
2 -0.08
1 -0.11

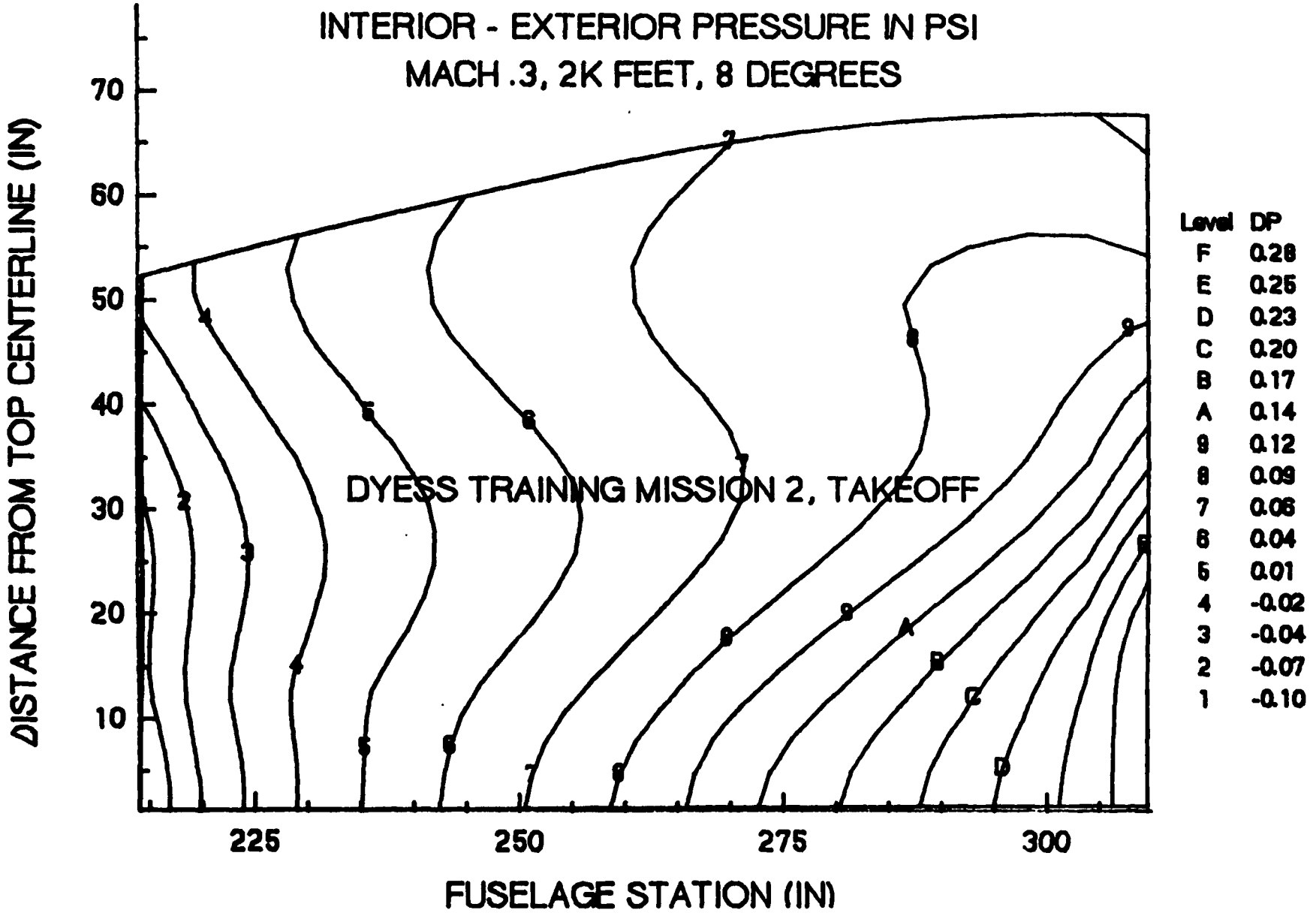

EXTERIOR TEMPERATURE IN DEGREES F
MACH .3, 2K FEET, 7 DEGREES
DYESS TRAINING MISSION 1, LANDING
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 53.10
E 52.81
D 52.52
C 52.23
B 51.93
A 51.64
9 51.35
8 51.08
7 50.77
6 50.48
5 50.18
4 49.89
3 49.60
2 49.31
1 49.02

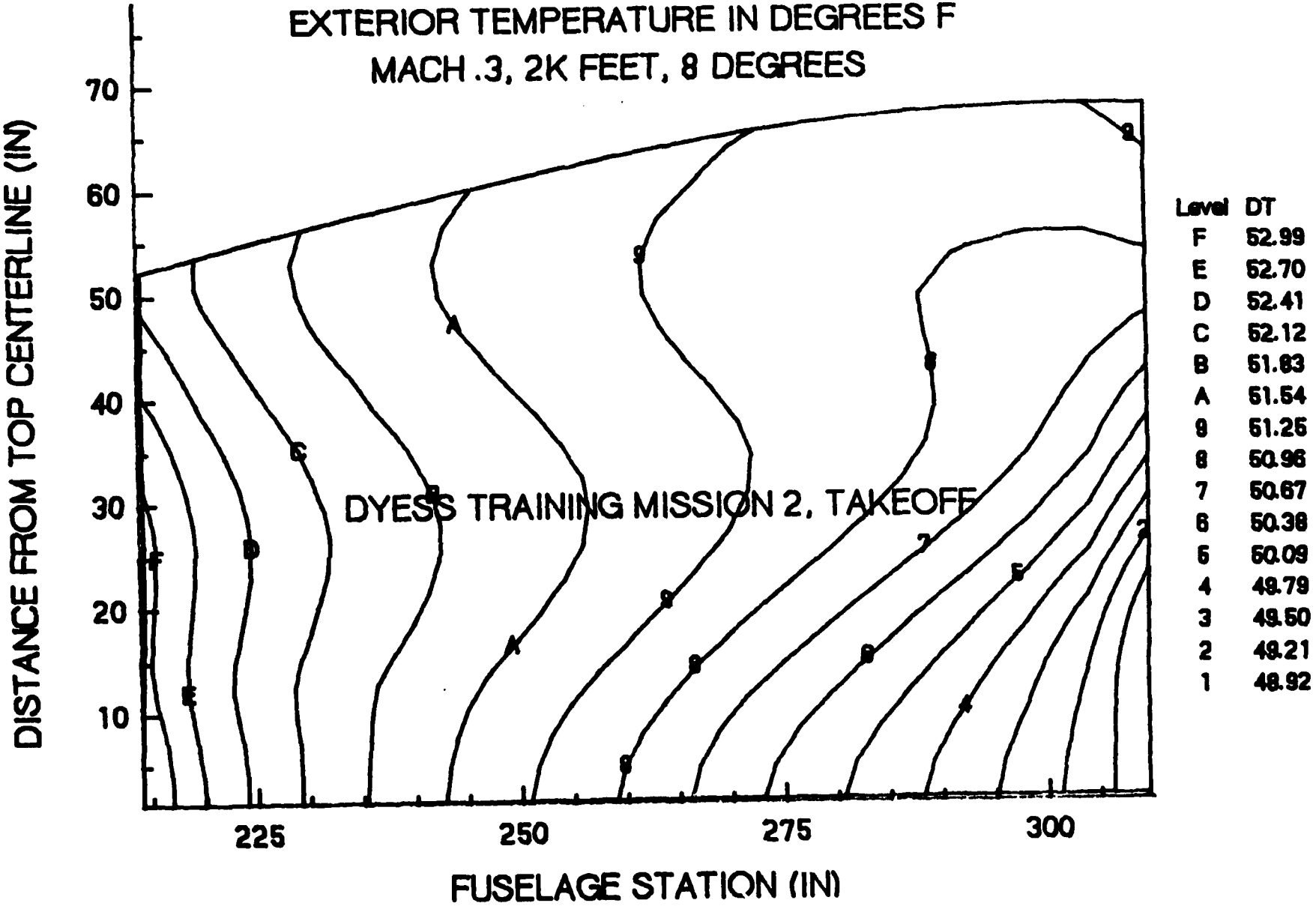
APPENDIX B

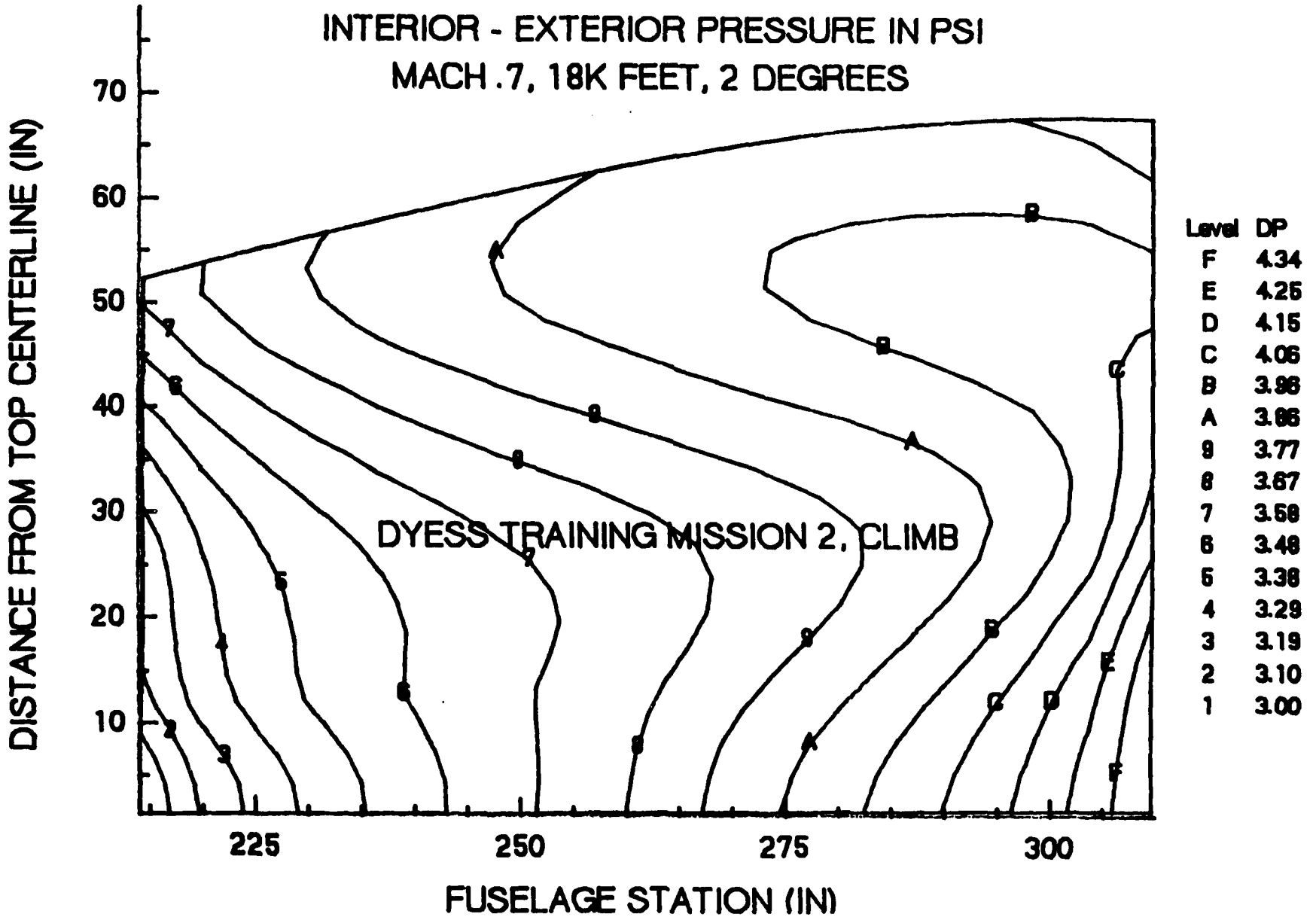
DYESS TRAINING MISSION 2

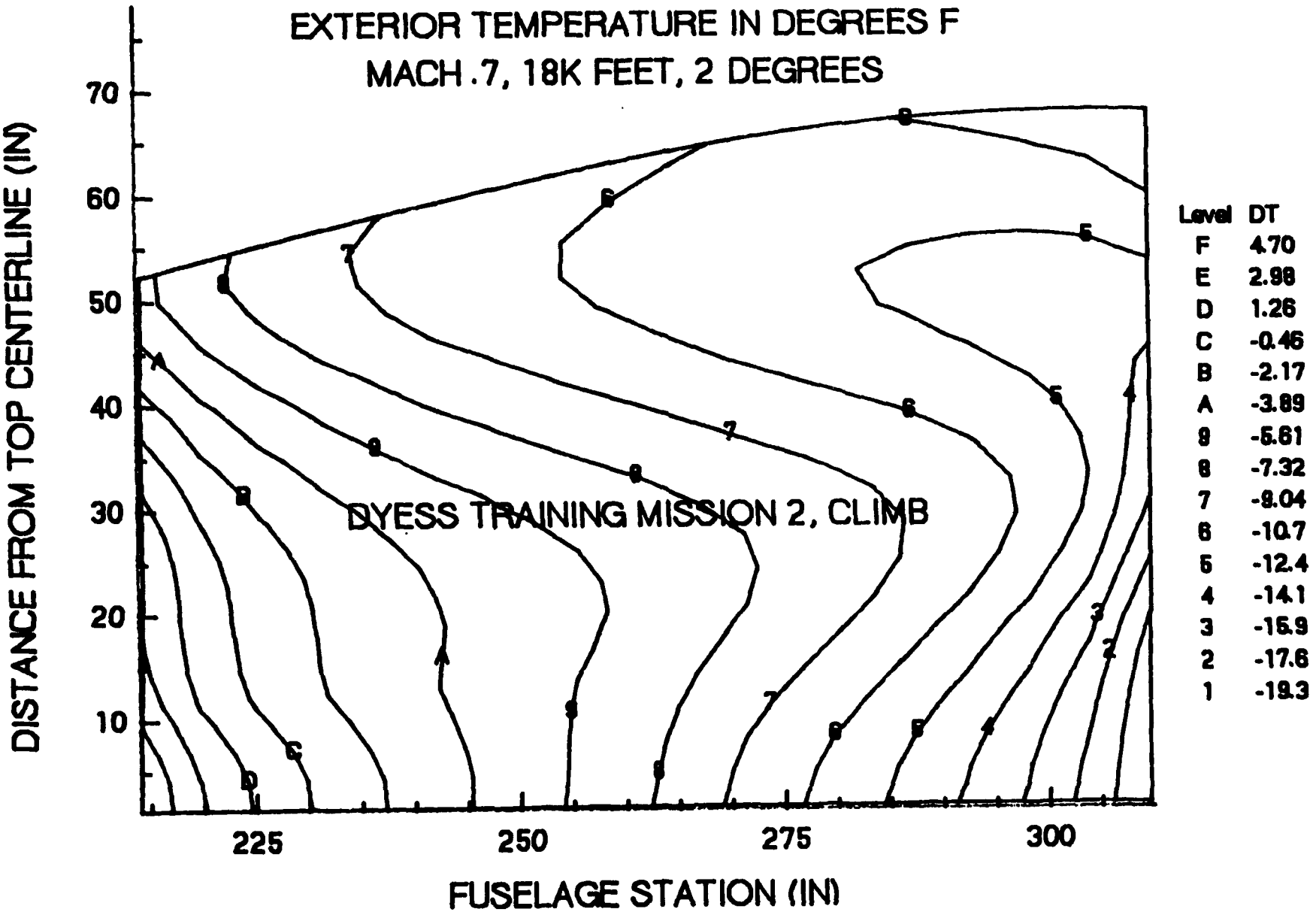
DYESS TRAINING MISSION #2

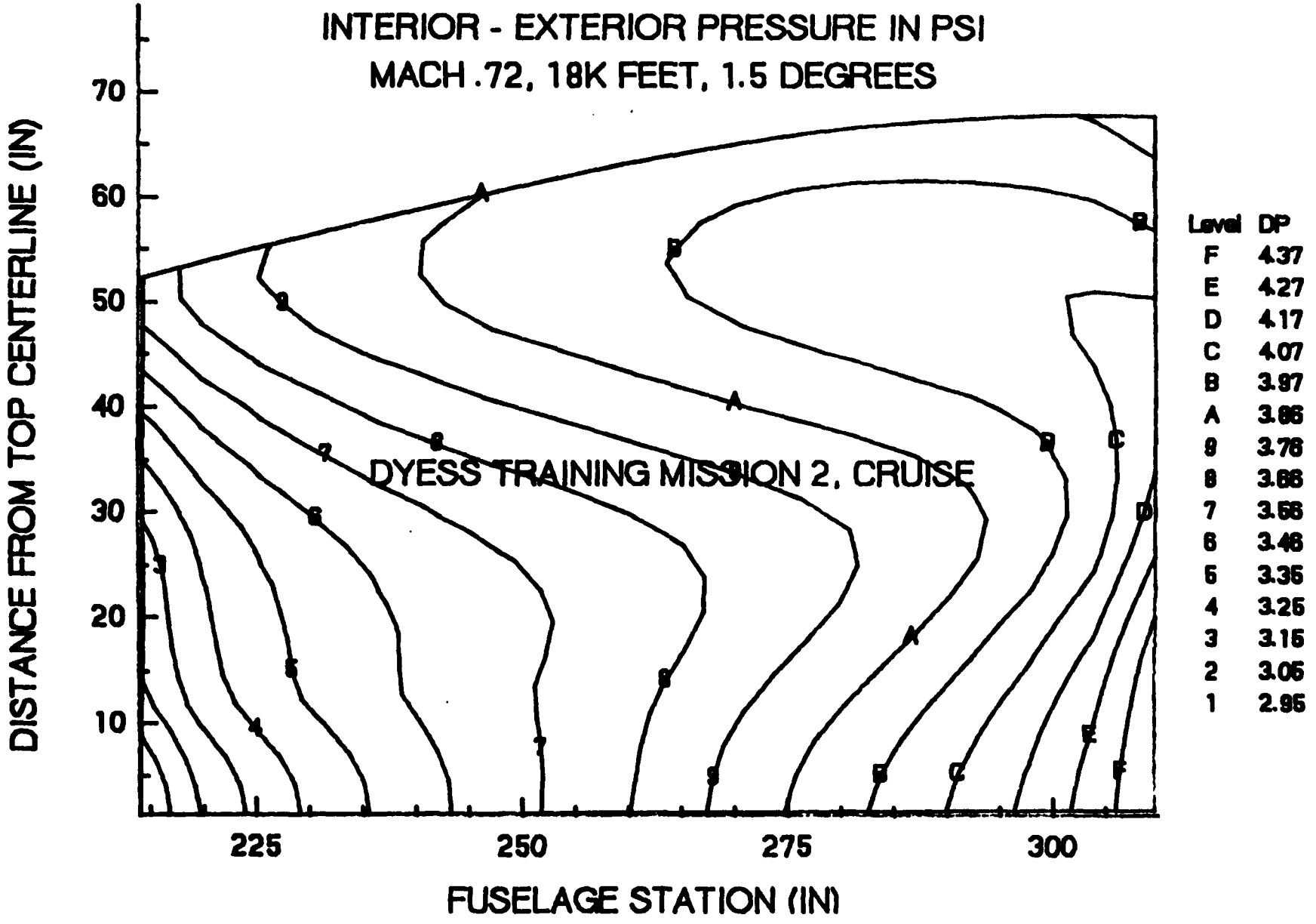
LEG	WING SWEEP (DEGREES)	MACH	ALTITUDE (1000 FT)	ALPHA (DEG)
TAKEOFF	20	.3	2	8
CLIMB	25	.7	18	2
CRUISE	25	.72	18	1.5
REFUEL	25	.70	20	1.8
CRUISE	25	.72	20	1.6
CRUISE	25	.72	23	1.5
DESCEND	67.5	.85	7	3
TERRAIN FOLLOW	67.5	.85	6	1.9
CLIMB/CRUISE	25	.72	16	.4
CRUISE	25	.72	19	.6
JET PENETRATION	25	.72	2	4
TOUCH & GO/LAND	20	.3	2	7

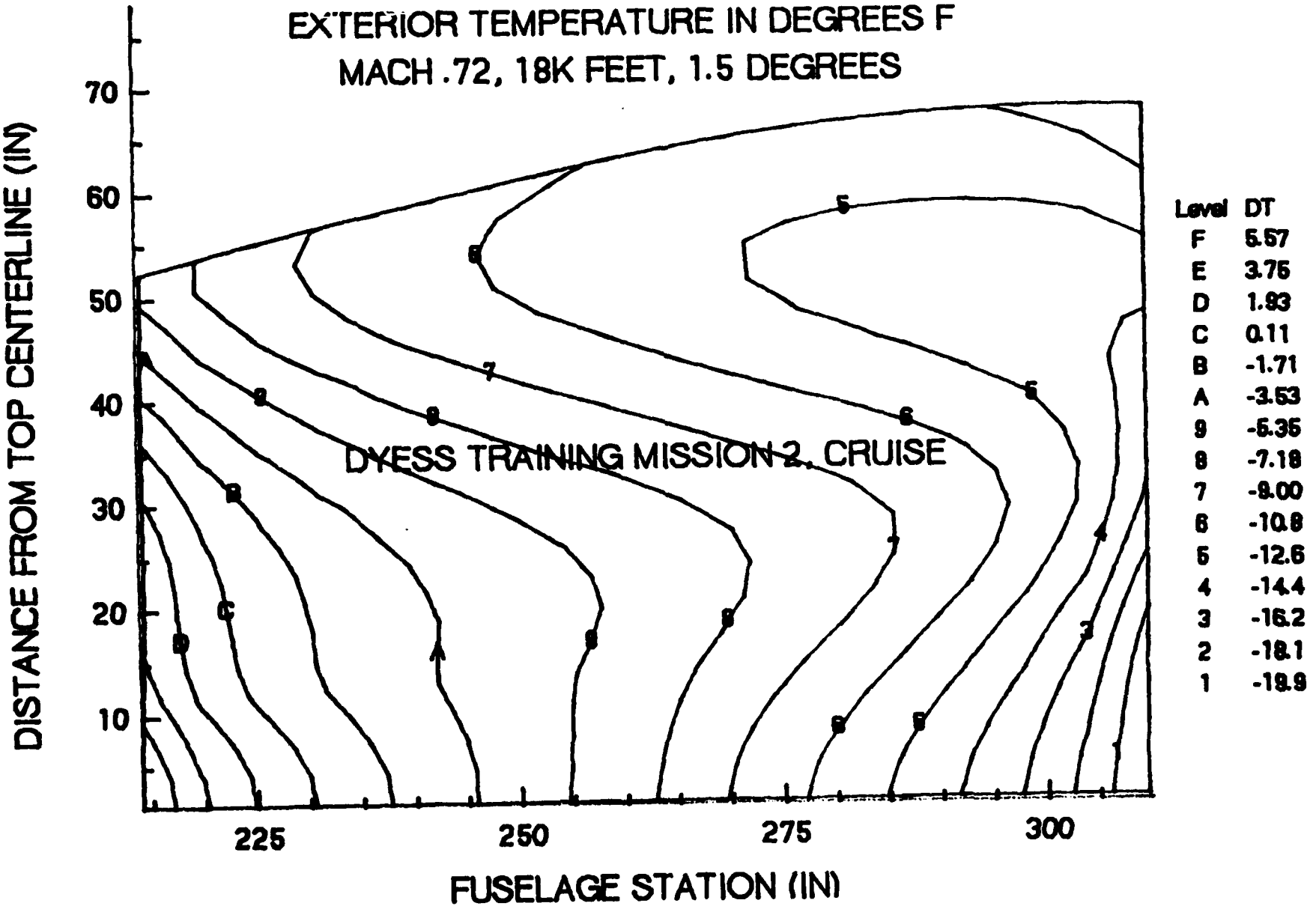

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .3, 2K FEET, 8 DEGREES
DYESS TRAINING MISSION 2, TAKEOFF
ΔISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 0.28
E 0.25
D 0.23
C 0.20
B 0.17
A 0.14
9 0.12
8 0.09
7 0.06
6 0.04
5 0.01
4 -0.02
3 -0.04
2 -0.07
1 -0.10

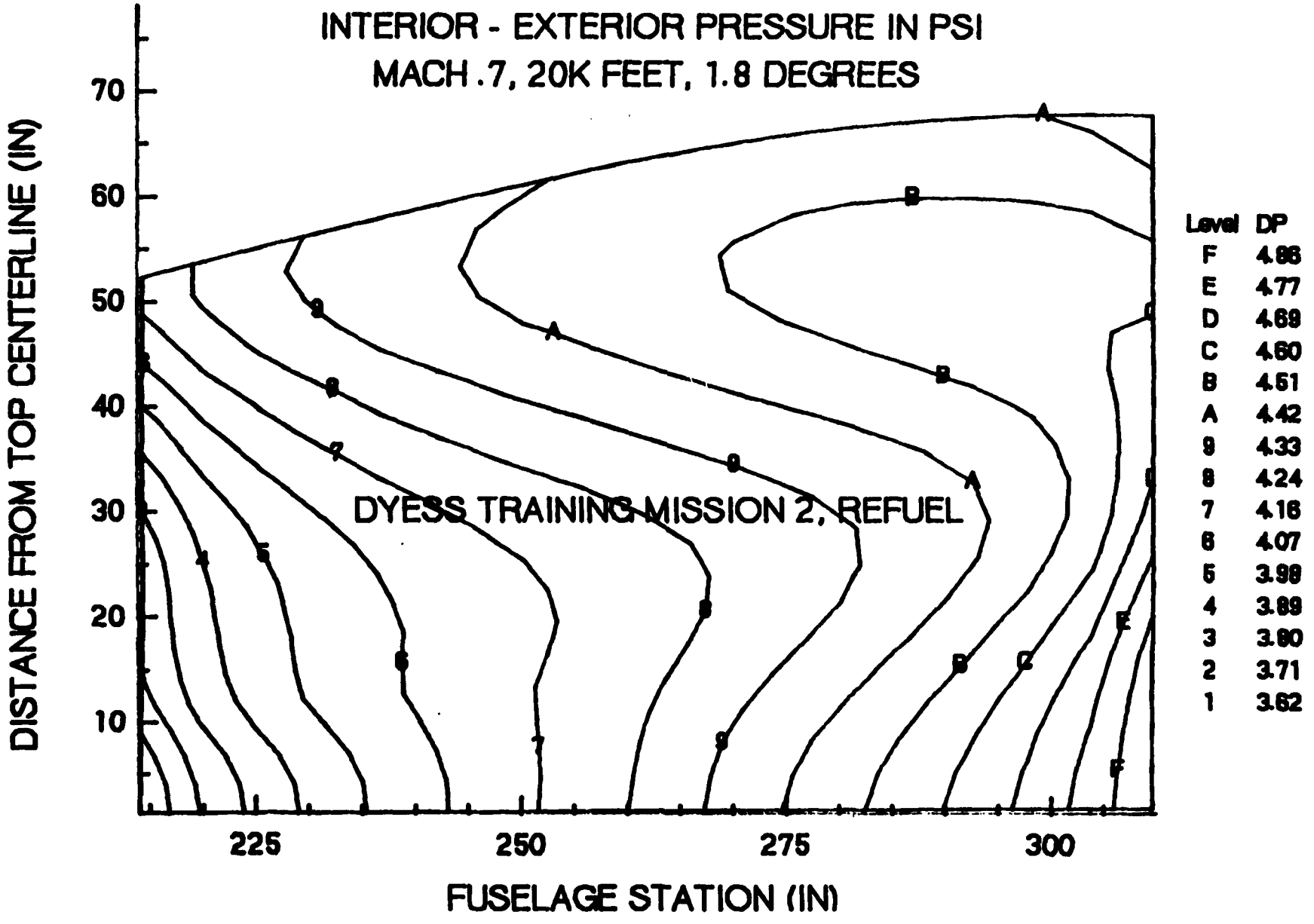

EXTERIOR TEMPERATURE IN DEGREES F
MACH .3, 2K FEET, 8 DEGREES
DYESS TRAINING MISSION 2, TAKEOFF
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 52.99
E 52.70
D 52.41
C 52.12
B 51.83
A 51.54
9 51.25
8 50.96
7 50.67
6 50.38
5 50.09
4 49.79
3 49.50
2 49.21
1 48.92

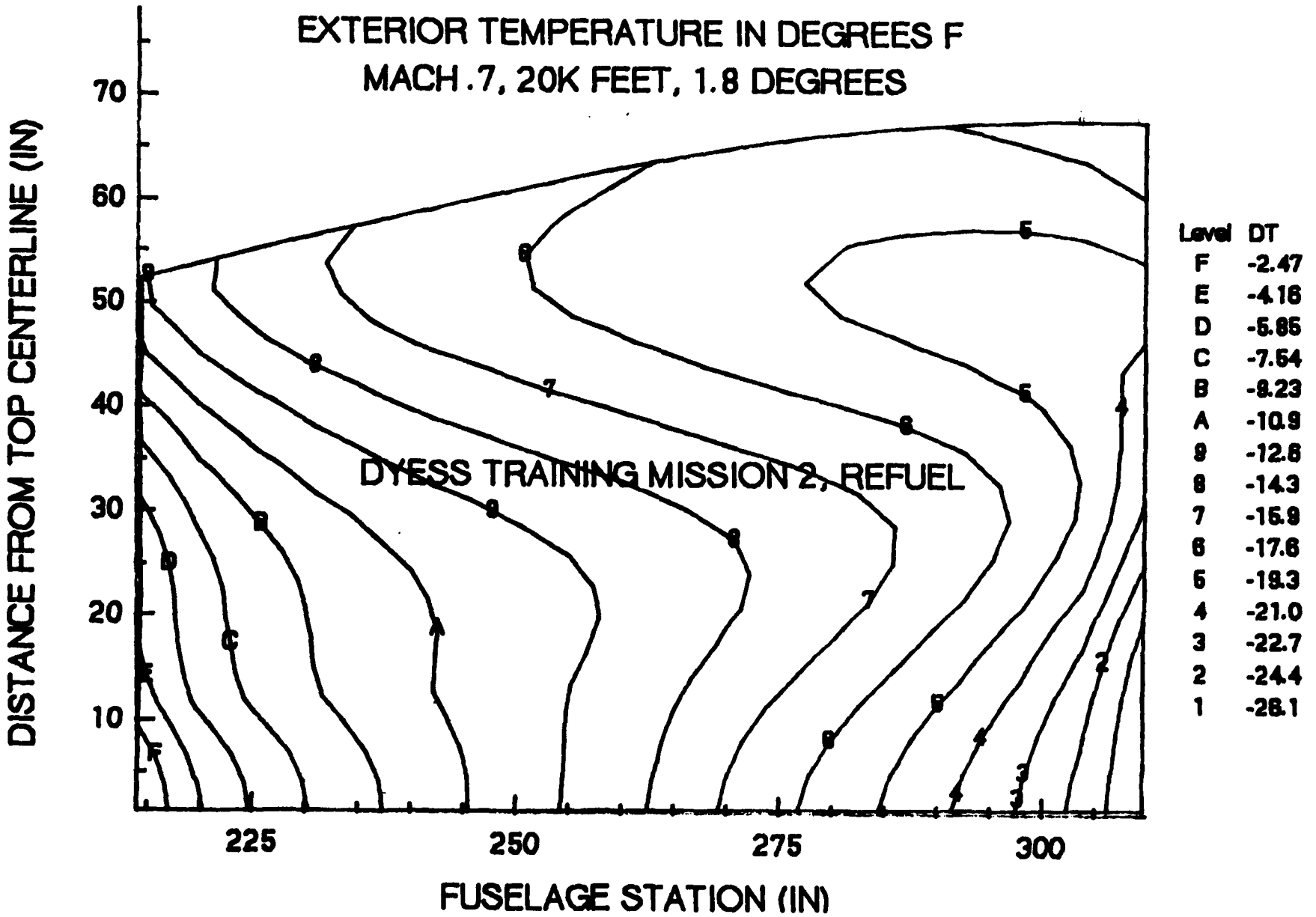

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .7, 18K FEET, 2 DEGREES
DYESS TRAINING MISSION 2, CLIMB
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.34
E 4.25
D 4.15
C 4.06
B 3.96
A 3.86
9 3.77
8 3.67
7 3.58
6 3.48
5 3.38
4 3.29
3 3.19
2 3.10
1 3.00

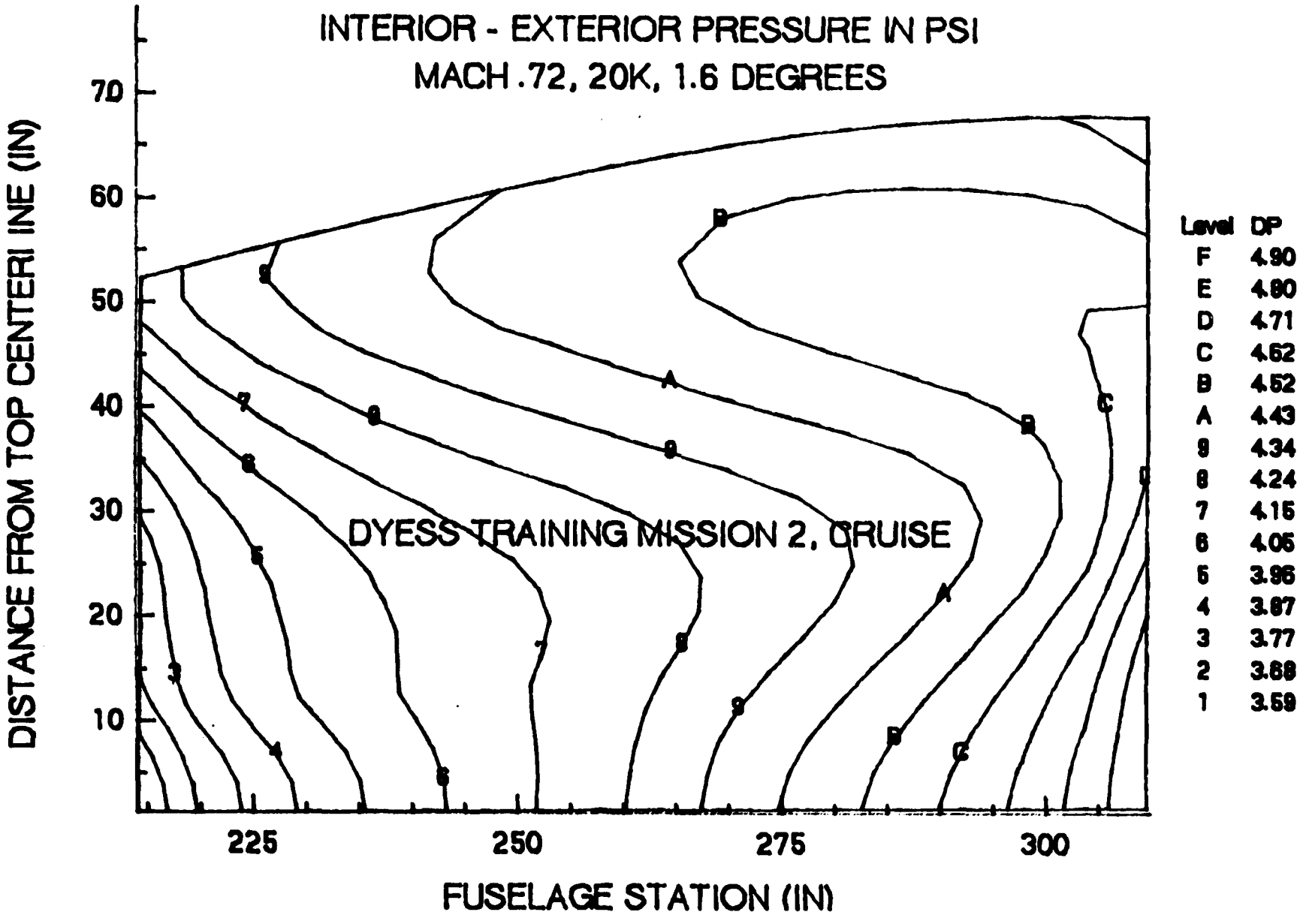

EXTERIOR TEMPERATURE IN DEGREES F
MACH .7, 18K FEET, 2 DEGREES
DYESS TRAINING MISSION 2, CLIMB
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 4.70
E 2.98
D 1.26
C -0.46
B -2.17
A -3.89
9 -5.61
8 -7.32
7 -9.04
6 -10.7
5 -12.4
4 -14.1
3 -15.9
2 -17.6
1 -19.3

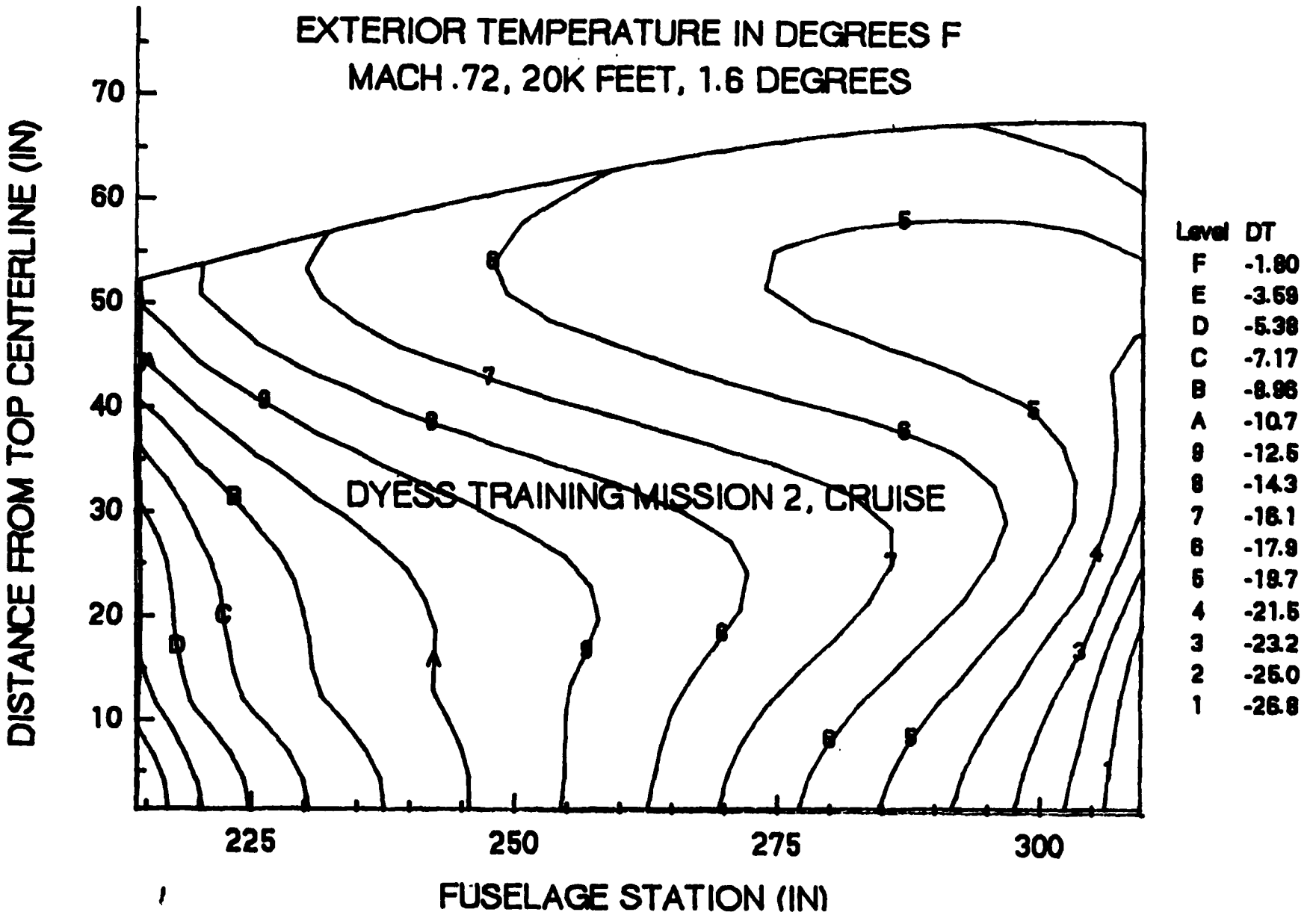

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 18K FEET, 1.5 DEGREES
DYESS TRAINING MISSION 2, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.37
E 4.27
D 4.17
C 4.07
B 3.97
A 3.86
9 3.76
8 3.66
7 3.56
6 3.46
5 3.35
4 3.25
3 3.15
2 3.05
1 2.95

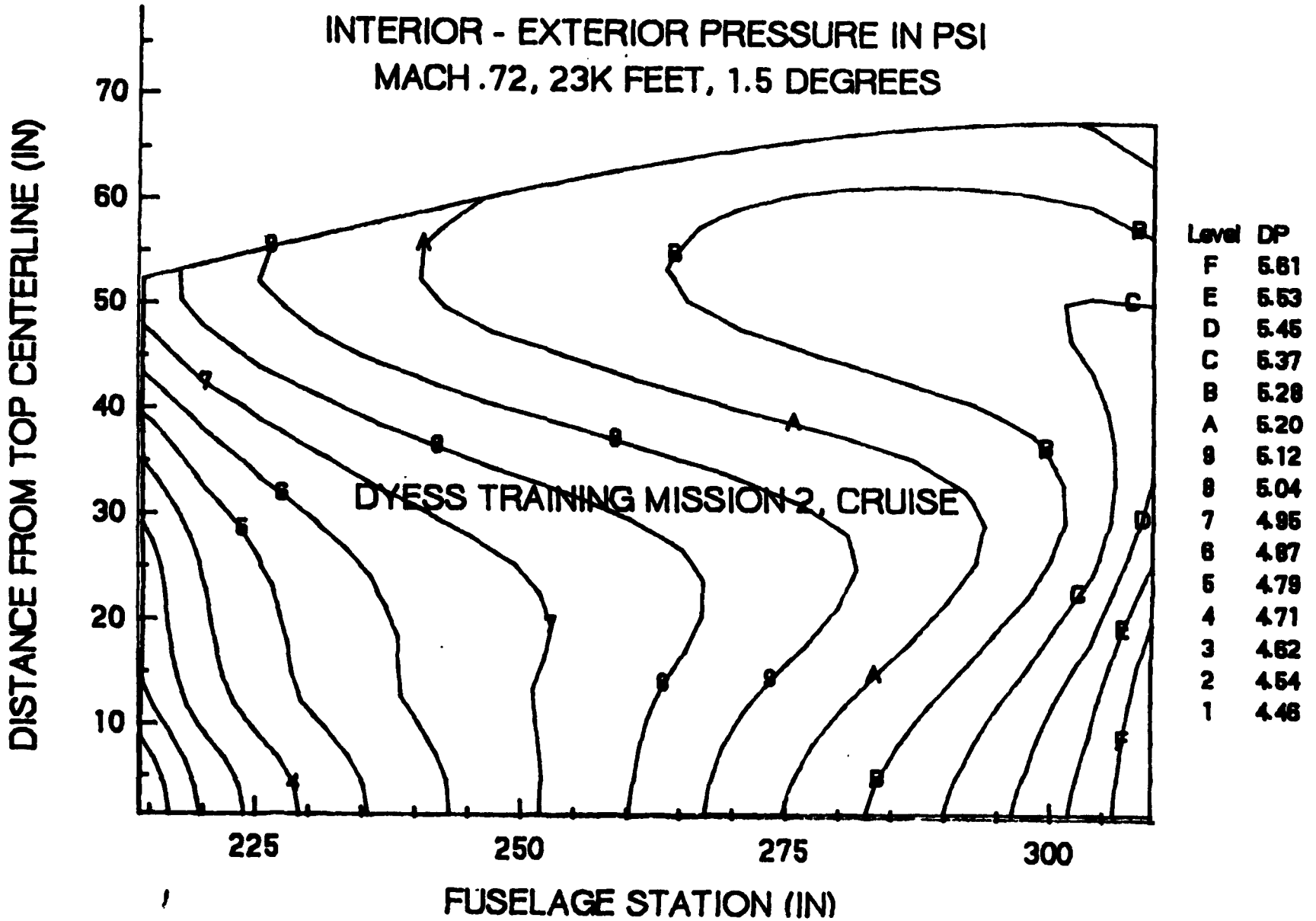

EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 18K FEET, 1.5 DEGREES
DYESS TRAINING MISSION 2, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 5.57
E 3.75
D 1.93
C 0.11
B -1.71
A -3.53
9 -5.35
8 -7.18
7 -9.00
6 -10.8
5 -12.6
4 -14.4
3 -16.2
2 -18.1
1 -19.9

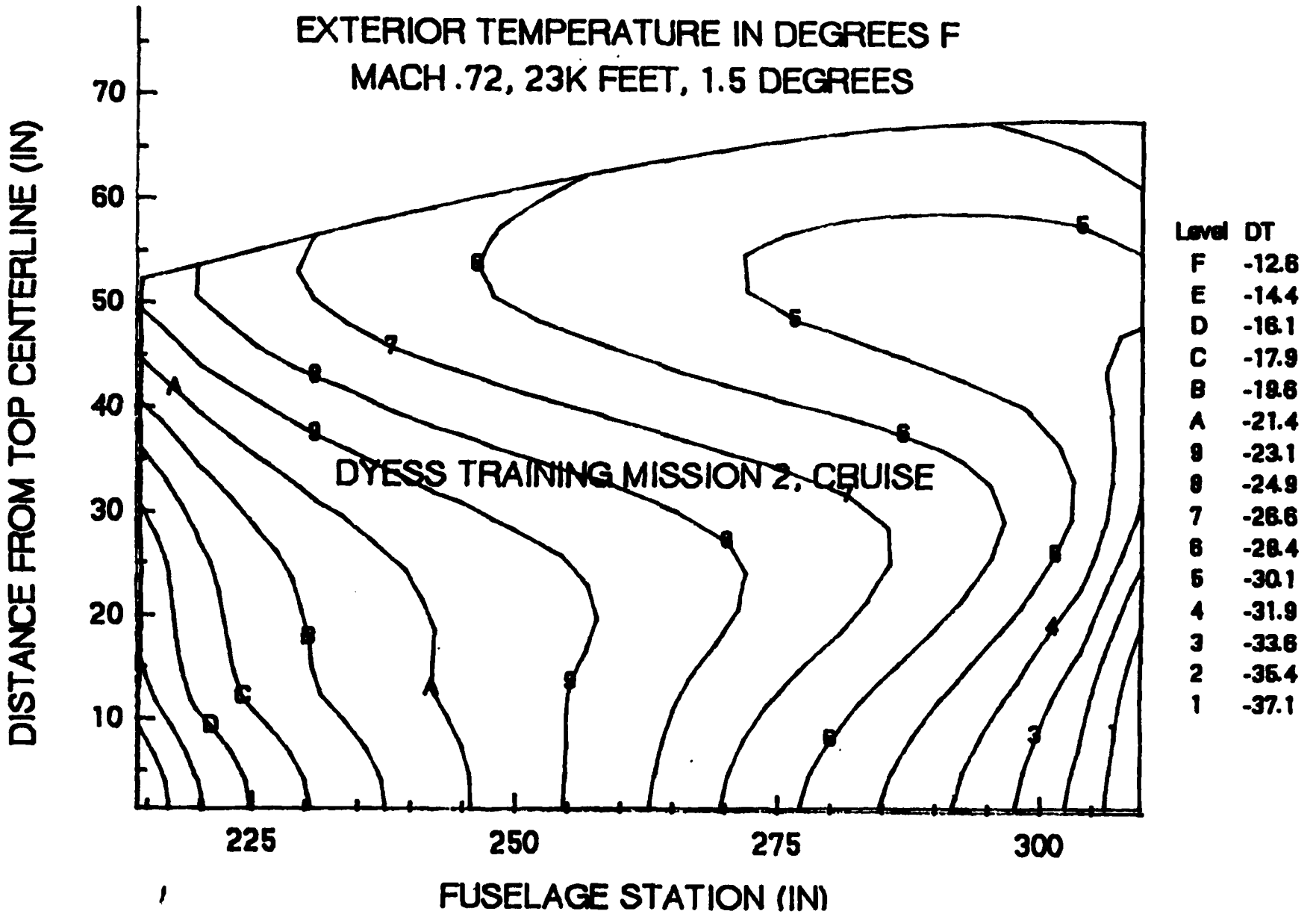

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .7, 20K FEET, 1.8 DEGREES
DYESS TRAINING MISSION 2, REFUEL
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.86
E 4.77
D 4.69
C 4.60
B 4.51
A 4.42
9 4.33
8 4.24
7 4.16
6 4.07
5 3.98
4 3.89
3 3.80
2 3.71
1 3.62

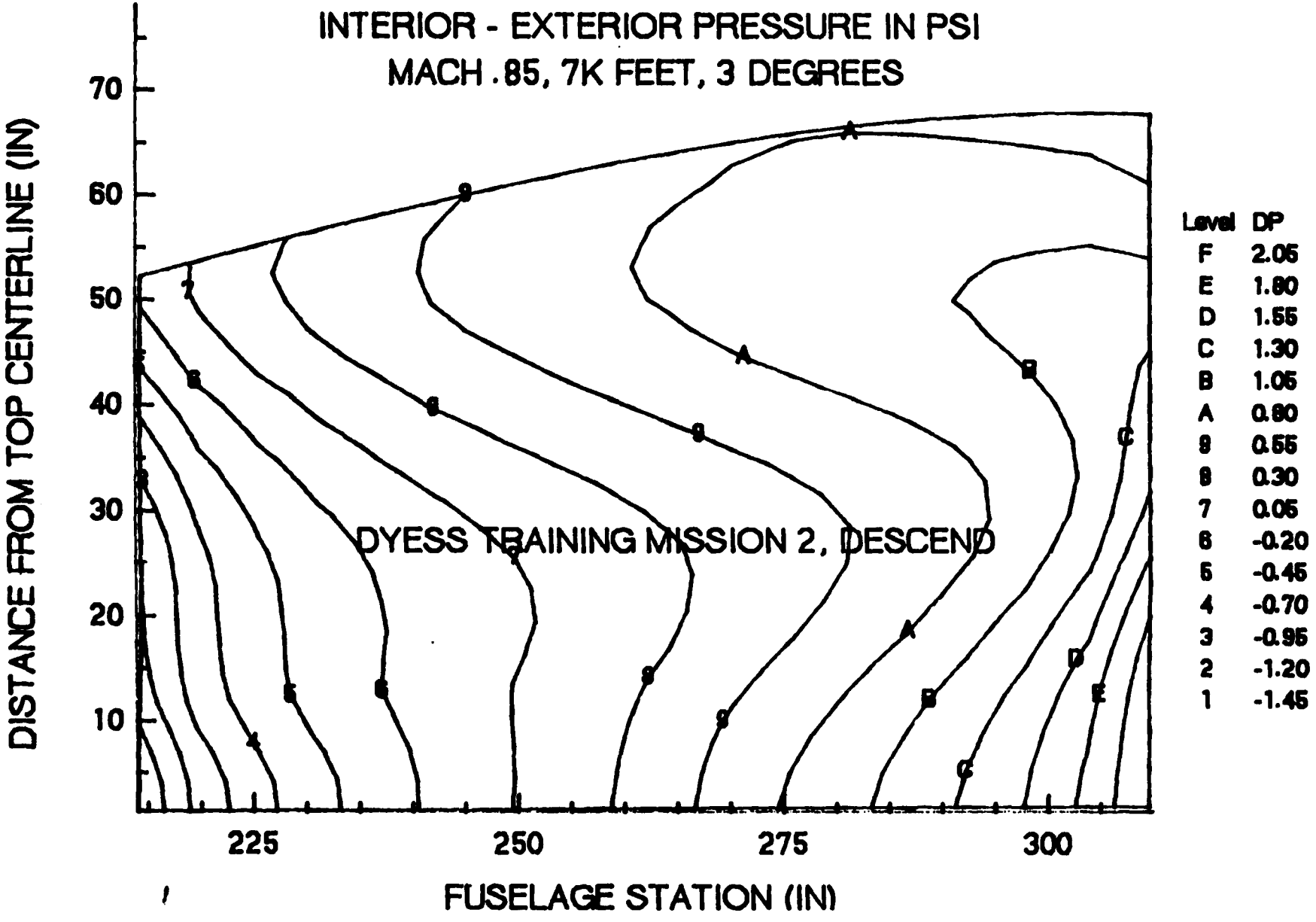

EXTERIOR TEMPERATURE IN DEGREES F
MACH .7, 20K FEET, 1.8 DEGREES
DYESS TRAINING MISSION 2, REFUEL
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F -2.47
E -4.16
D -5.85
C -7.54
B -8.23
A -10.9
9 -12.6
8 -14.3
7 -15.9
6 -17.6
5 -19.3
4 -21.0
3 -22.7
2 -24.4
1 -26.1

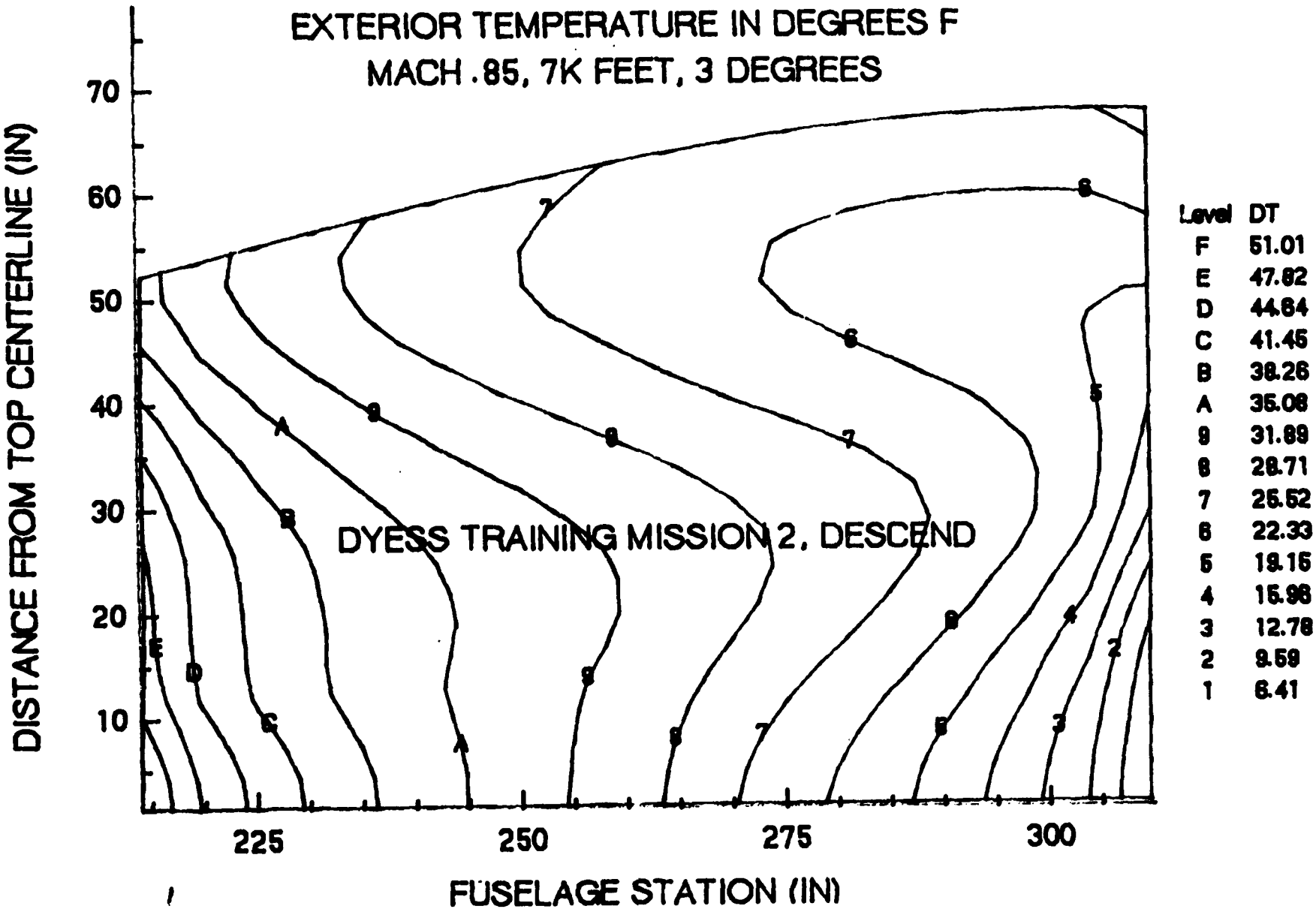

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 20K, 1.6 DEGREES
DYESS TRAINING MISSION 2, CRUISE
DISTANCE FROM TOP CENTERI INE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.90
E 4.80
D 4.71
C 4.62
B 4.52
A 4.43
9 4.34
8 4.24
7 4.15
6 4.05
5 3.96
4 3.87
3 3.77
2 3.68
1 3.59

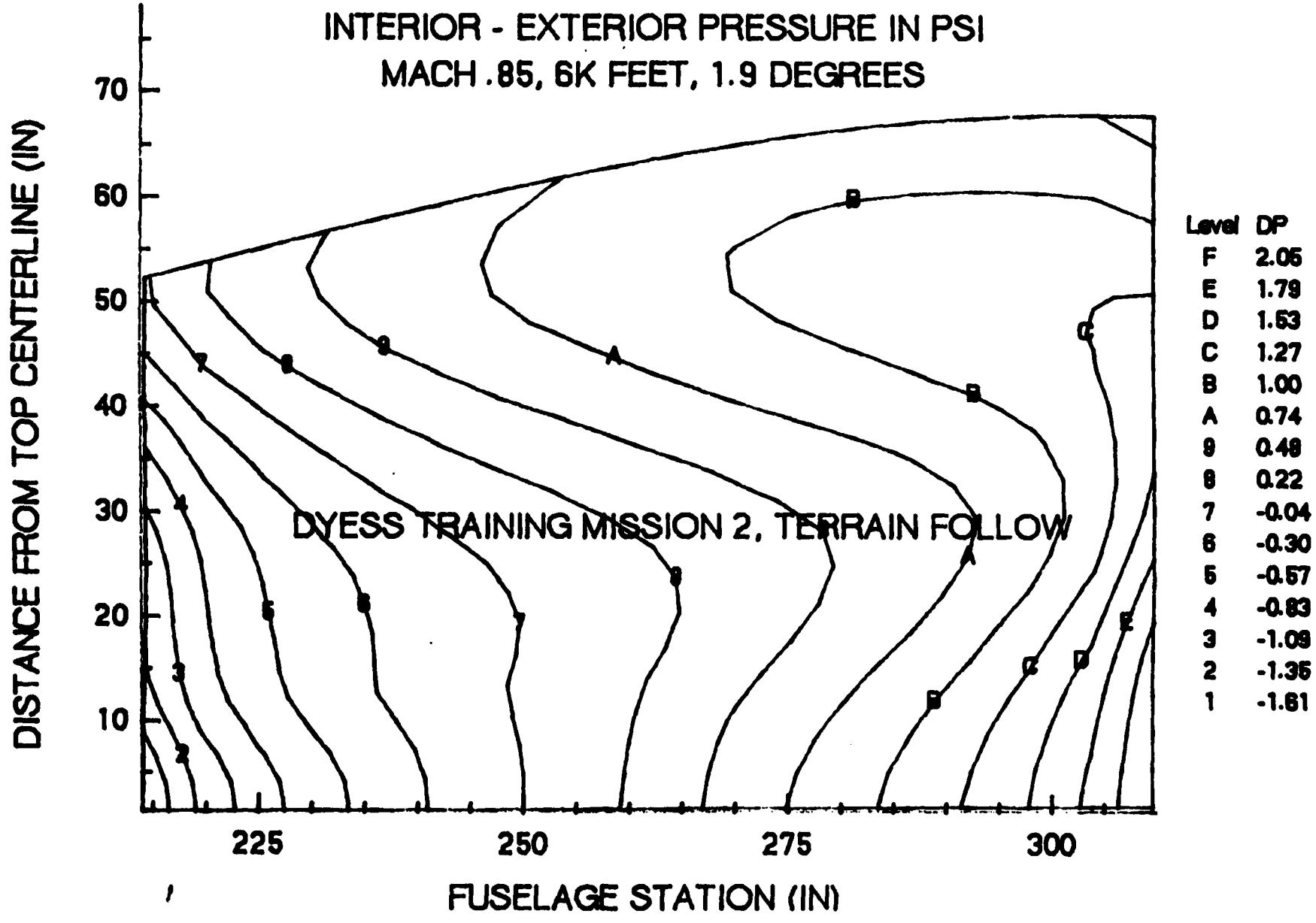

EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 20K FEET, 1.6 DEGREES
DYESS TRAINING MISSION 2, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F -1.80
E -3.59
D -5.38
C -7.17
B -8.96
A -10.7
9 -12.5
8 -14.3
7 -16.1
6 -17.9
5 -19.7
4 -21.5
3 -23.2
2 -25.0
1 -26.8

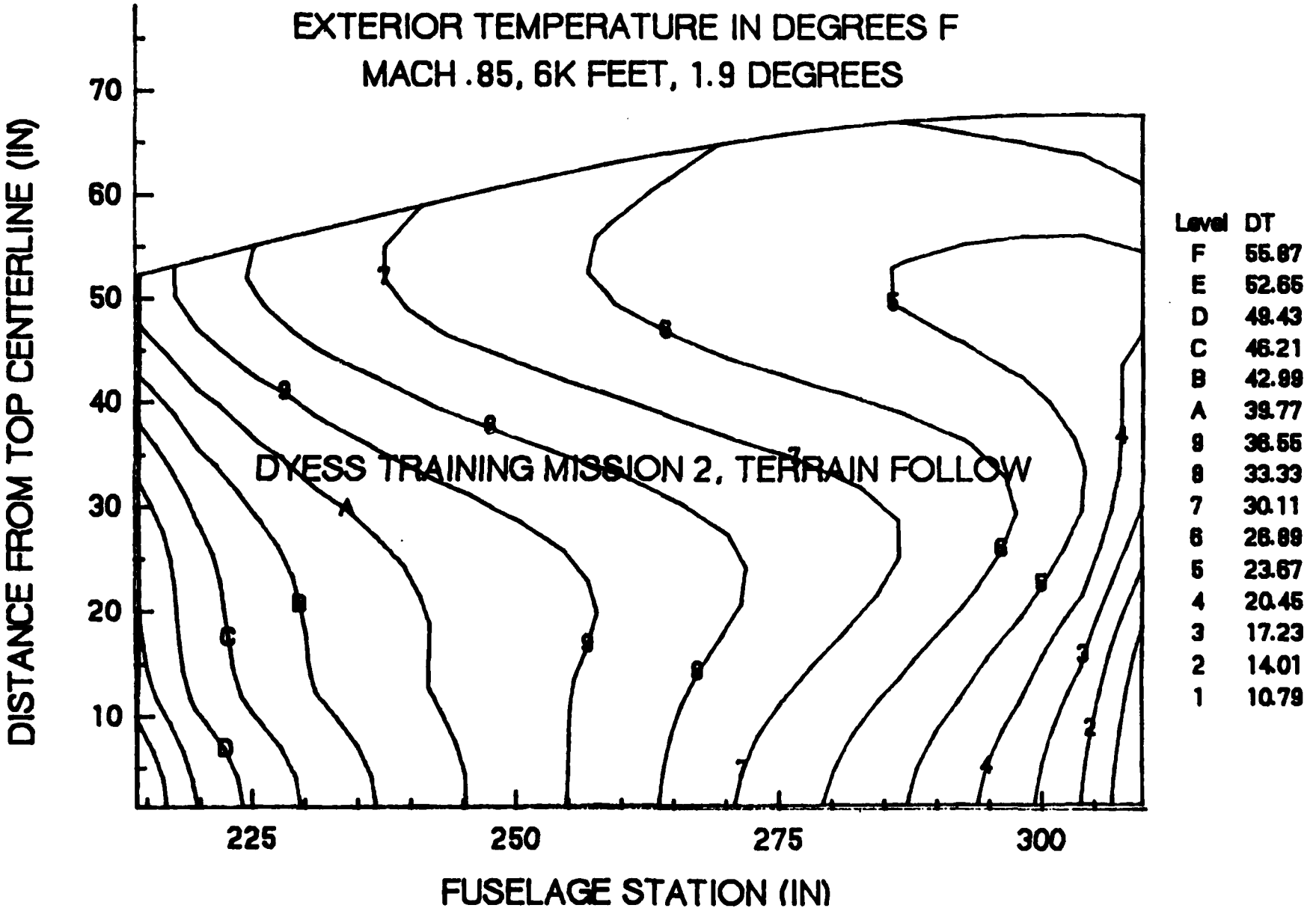

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 23K FEET, 1.5 DEGREES
DYESS TRAINING MISSION 2, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 5.61
E 5.53
D 5.45
C 5.37
B 5.28
A 5.20
9 5.12
8 5.04
7 4.95
6 4.87
5 4.79
4 4.71
3 4.62
2 4.54
1 4.46

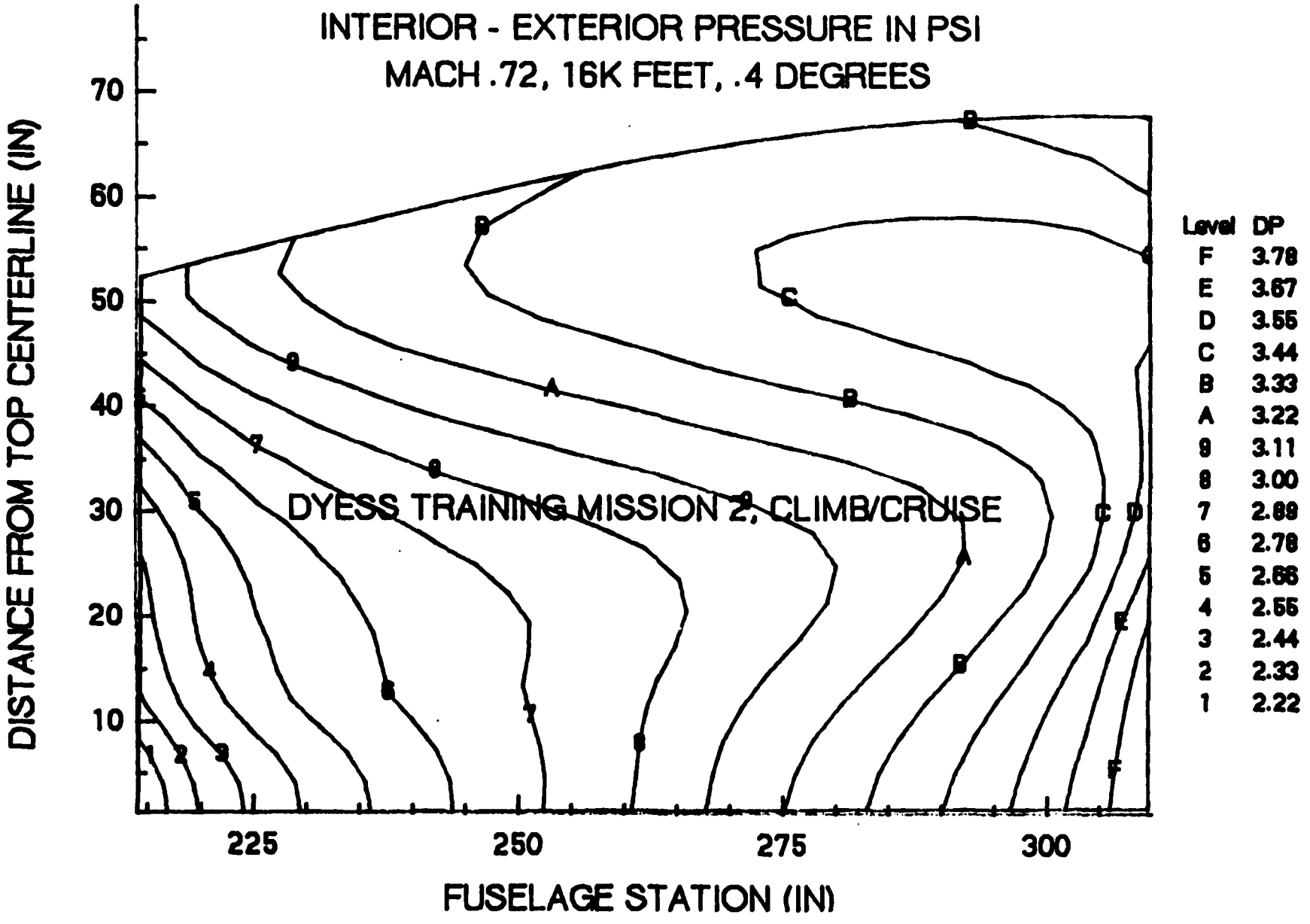

EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 23K FEET, 1.5 DEGREES
DYESS TRAINING MISSION 2, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F -12.6
E -14.4
D -16.1
C -17.9
B -19.6
A -21.4
9 -23.1
8 -24.9
7 -26.6
6 -28.4
5 -30.1
4 -31.9
3 -33.6
2 -35.4
1 -37.1

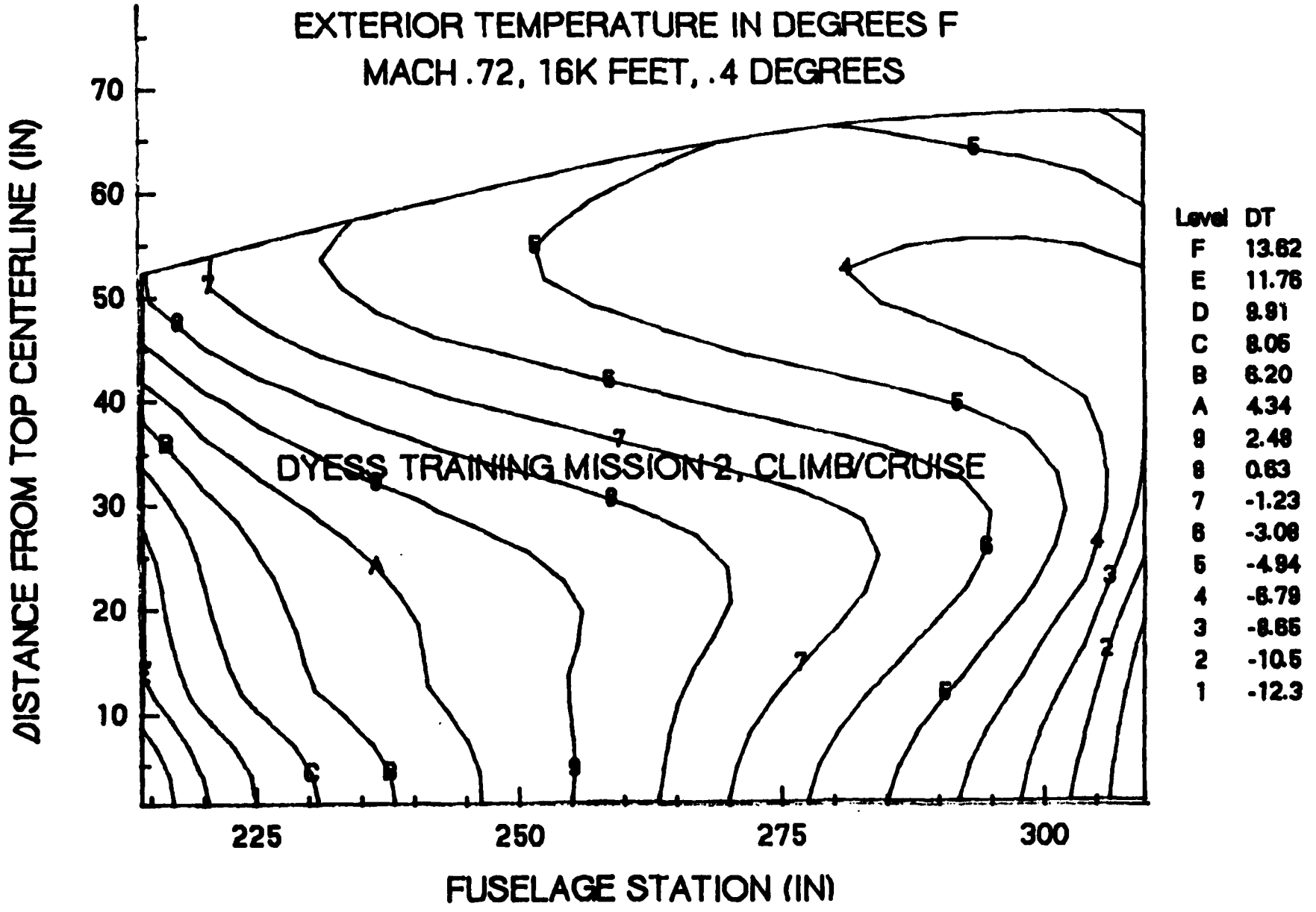

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .85, 7K FEET, 3 DEGREES
DYESS TRAINING MISSION 2, DESCEND
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 2.05
E 1.80
D 1.55
C 1.30
B 1.05
A 0.80
9 0.55
8 0.30
7 0.05
6 -0.20
5 -0.45
4 -0.70
3 -0.95
2 -1.20
1 -1.45

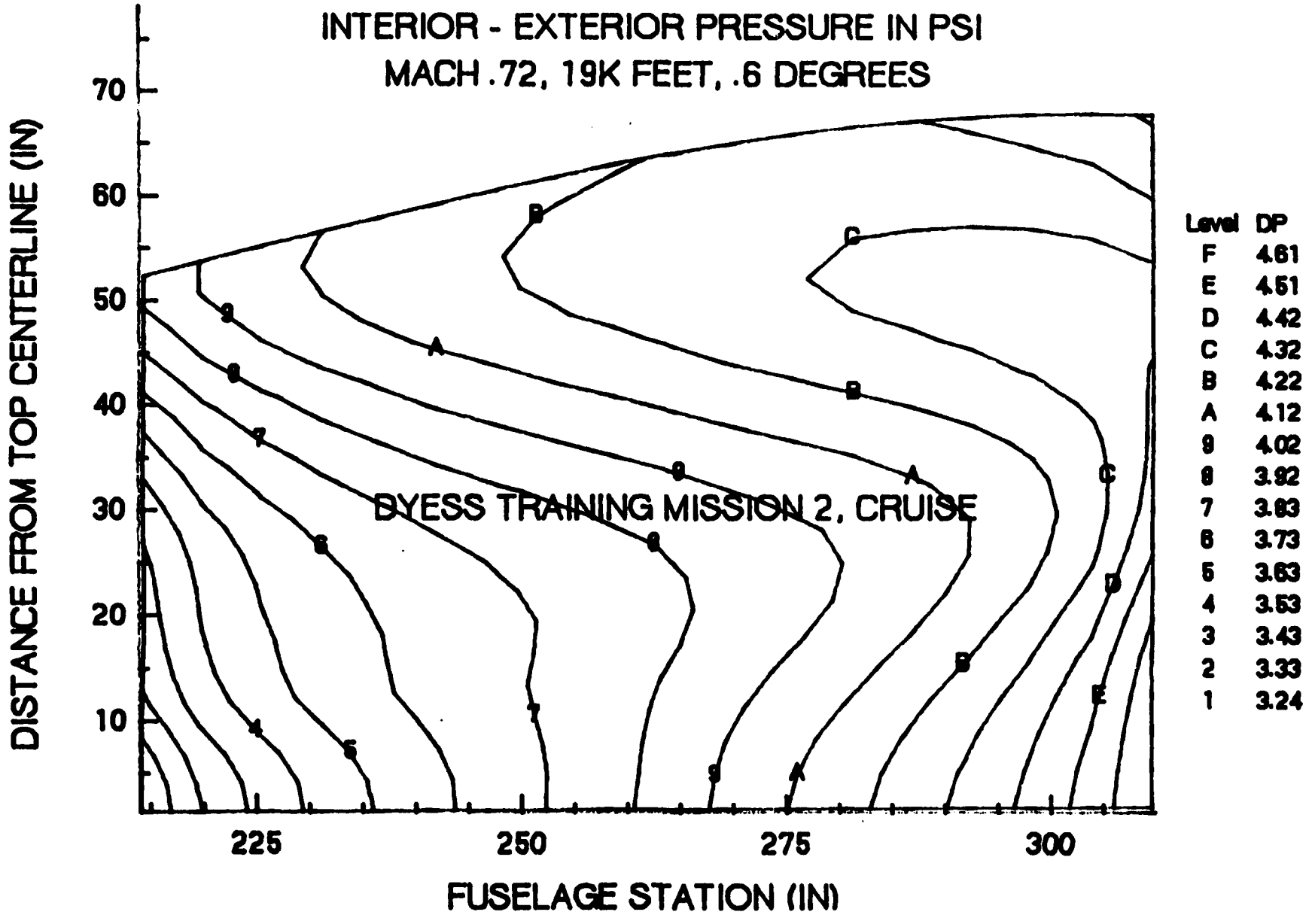

EXTERIOR TEMPERATURE IN DEGREES F
MACH .85, 7K FEET, 3 DEGREES
DYESS TRAINING MISSION 2, DESCEND
DISTANCE FROM TOP CENTERLINE (IN)
FUSELAGE STATION (IN)
70
60
50
40
30
20
10
225
250
275
300
Level DT
F 51.01
E 47.82
D 44.64
C 41.45
B 38.26
A 35.08
9 31.89
8 28.71
7 25.52
6 22.33
5 19.15
4 15.96
3 12.78
2 9.59
1 6.41

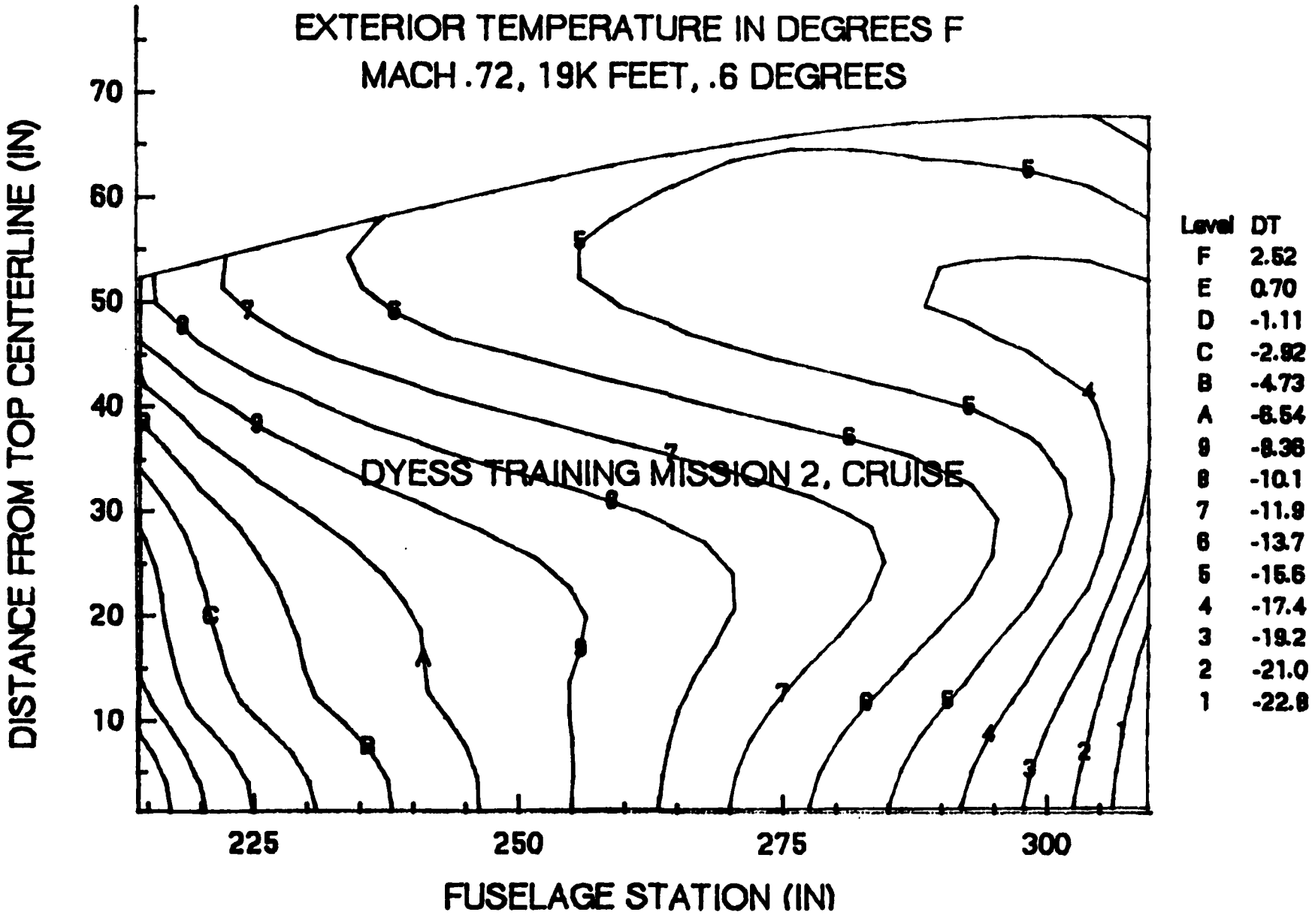

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .85, 6K FEET, 1.9 DEGREES
DYESS TRAINING MISSION 2, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 2.05
E 1.79
D 1.53
C 1.27
B 1.00
A 0.74
9 0.48
8 0.22
7 -0.04
6 -0.30
5 -0.57
4 -0.83
3 -1.09
2 -1.35
1 -1.61

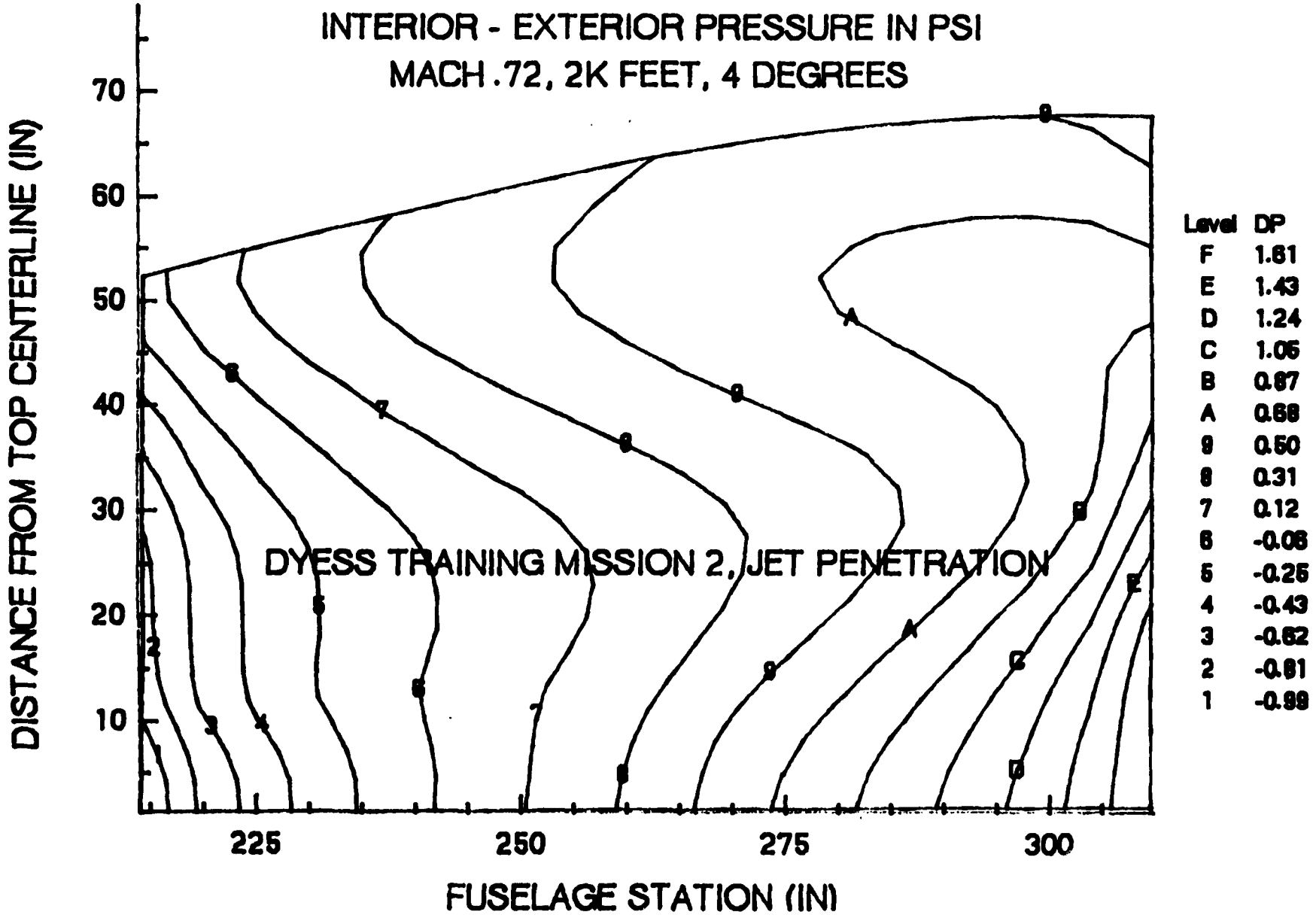

EXTERIOR TEMPERATURE IN DEGREES F
MACH .85, 6K FEET, 1.9 DEGREES
DYESS TRAINING MISSION 2, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 55.87
E 52.65
D 49.43
C 46.21
B 42.99
A 39.77
9 36.55
8 33.33
7 30.11
6 26.89
5 23.67
4 20.45
3 17.23
2 14.01
1 10.79

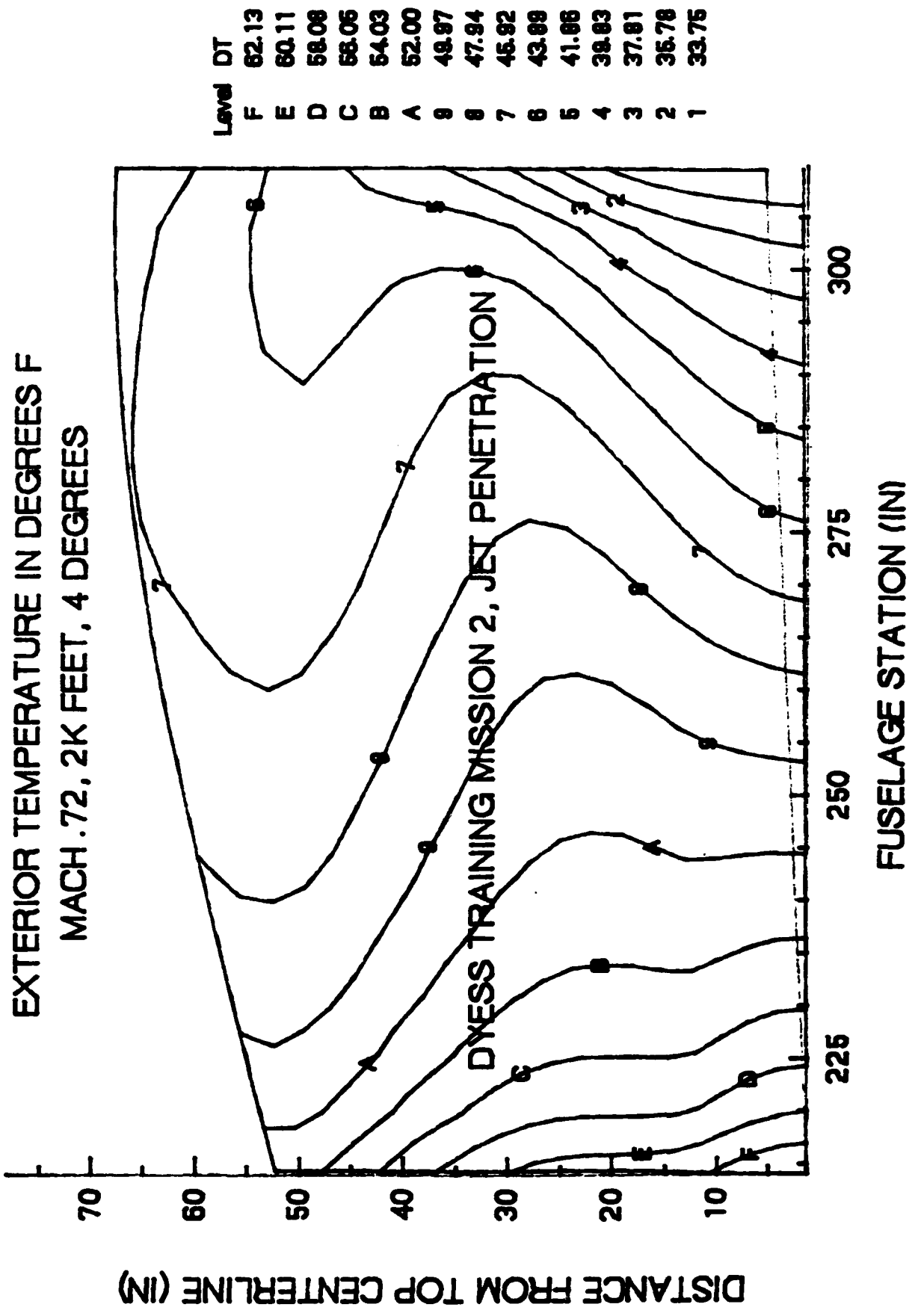

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 16K FEET, .4 DEGREES
DYESS TRAINING MISSION 2, CLIMB/CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 3.78
E 3.67
D 3.55
C 3.44
B 3.33
A 3.22
9 3.11
8 3.00
7 2.89
6 2.78
5 2.66
4 2.55
3 2.44
2 2.33
1 2.22

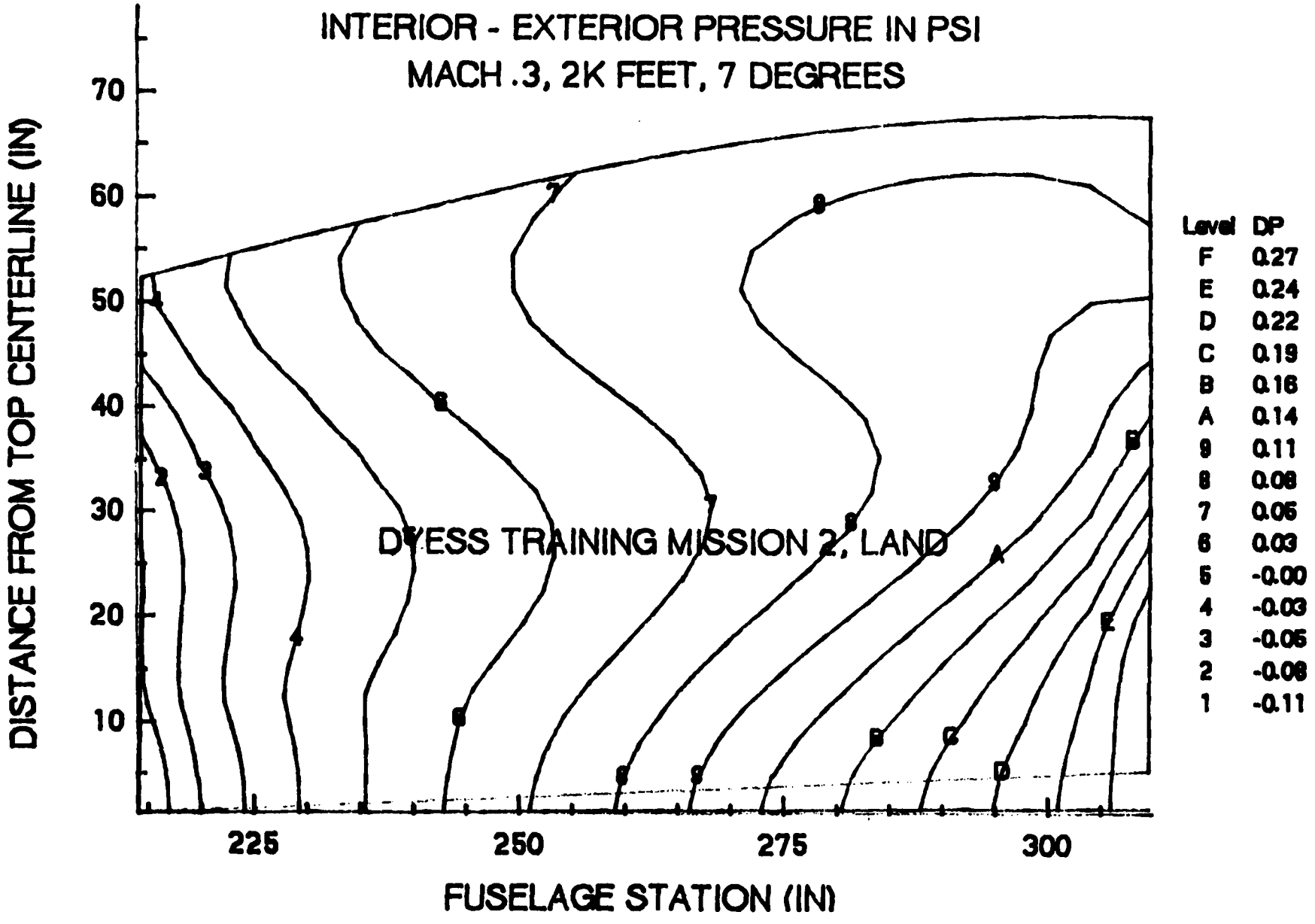

EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 16K FEET, .4 DEGREES
DYESS TRAINING MISSION 2, CLIMB/CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
FUSELAGE STATION (IN)
70
60
50
40
30
20
10
225
250
275
300
Level DT
F 13.62
E 11.76
D 9.91
C 8.05
B 6.20
A 4.34
9 2.48
8 0.63
7 -1.23
6 -3.08
5 -4.94
4 -6.79
3 -8.65
2 -10.5
1 -12.3

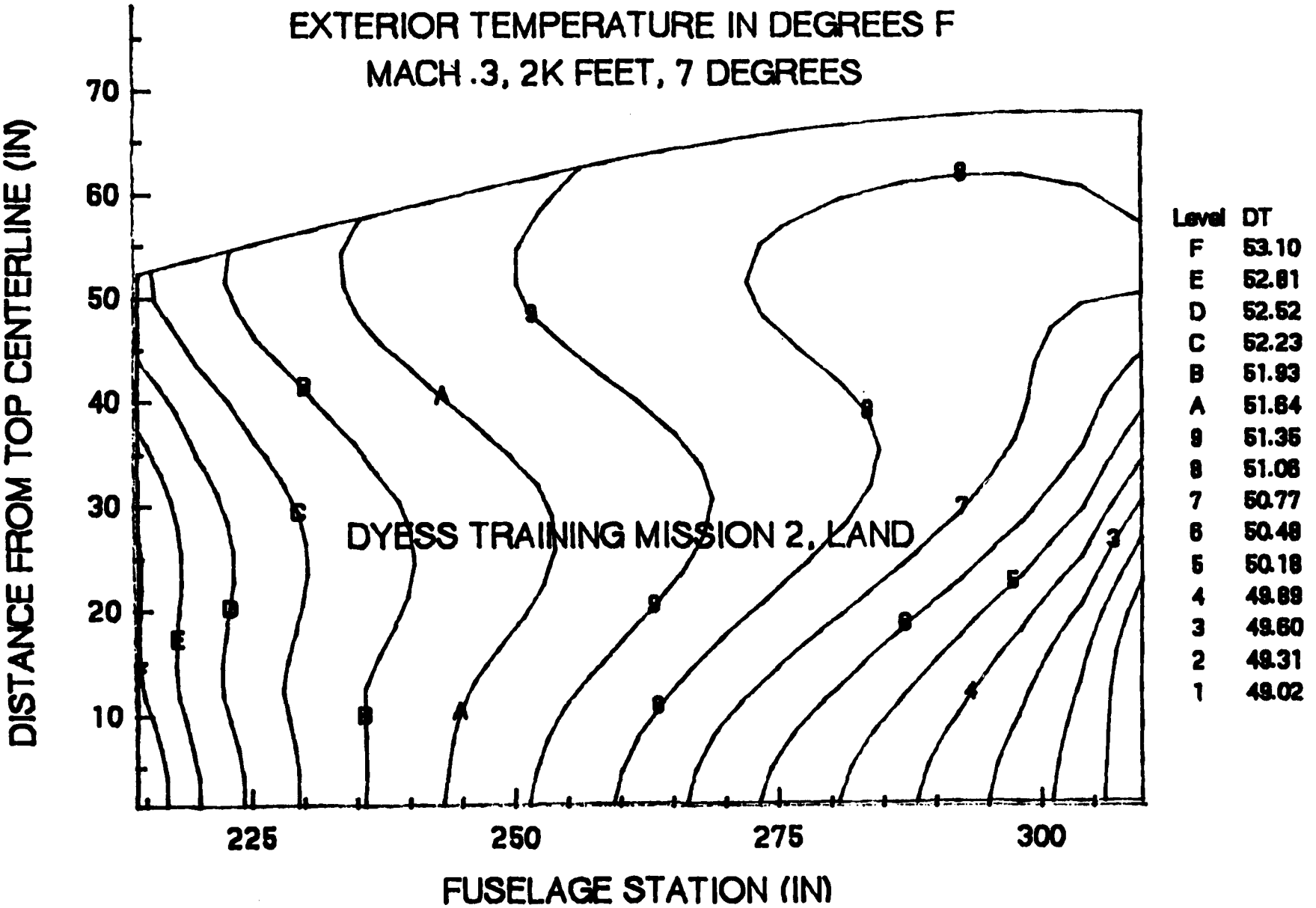

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 19K FEET, .6 DEGREES
DYESS TRAINING MISSION 2, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.61
E 4.51
D 4.42
C 4.32
B 4.22
A 4.12
9 4.02
8 3.92
7 3.83
6 3.73
5 3.63
4 3.53
3 3.43
2 3.33
1 3.24


EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 19K FEET, .6 DEGREES
DYESS TRAINING MISSION 2, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 2.52
E 0.70
D -1.11
C -2.92
B -4.73
A -6.54
9 -8.36
8 -10.1
7 -11.9
6 -13.7
5 -15.6
4 -17.4
3 -19.2
2 -21.0
1 -22.8


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 2K FEET, 4 DEGREES
DYESS TRAINING MISSION 2, JET PENETRATION
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 1.61
E 1.43
D 1.24
C 1.06
B 0.87
A 0.68
9 0.50
8 0.31
7 0.12
6 -0.06
5 -0.25
4 -0.43
3 -0.62
2 -0.81
1 -0.99


EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 2K FEET, 4 DEGREES
DYESS TRAINING MISSION 2, JET PENETRATION
Level DT
F 62.13
E 60.11
D 58.08
C 56.05
B 54.03
A 52.00
9 49.97
8 47.94
7 45.92
6 43.89
5 41.86
4 39.83
3 37.81
2 35.78
1 33.75
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
DISTANCE FROM TOP CENTERLINE (IN)


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .3, 2K FEET, 7 DEGREES
DYESS TRAINING MISSION 2, LAND
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 0.27
E 0.24
D 0.22
C 0.19
B 0.16
A 0.14
9 0.11
8 0.08
7 0.06
6 0.03
5 -0.00
4 -0.03
3 -0.06
2 -0.08
1 -0.11

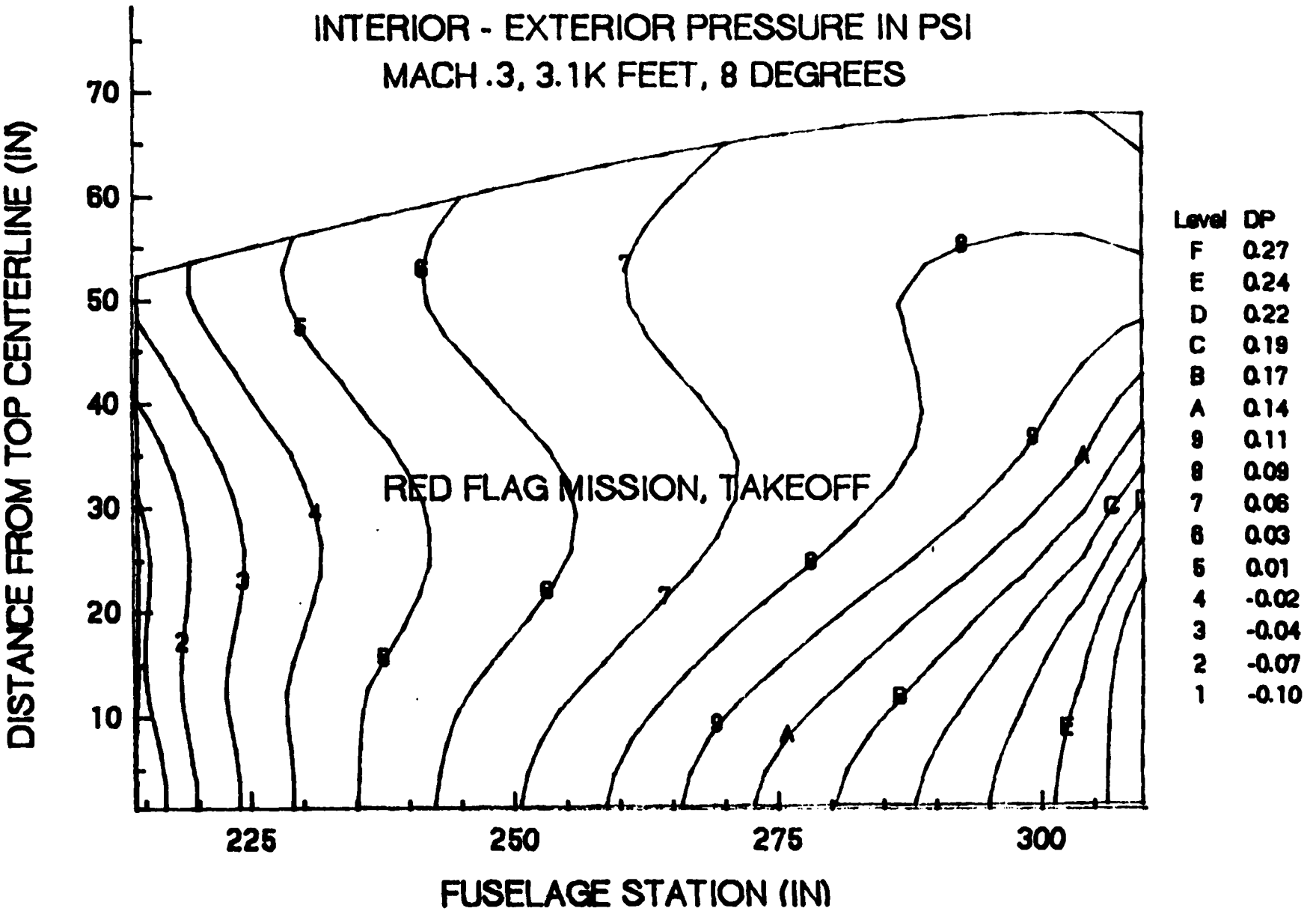

EXTERIOR TEMPERATURE IN DEGREES F
MACH .3, 2K FEET, 7 DEGREES
DYESS TRAINING MISSION 2, LAND
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 53.10
E 52.81
D 52.52
C 52.23
B 51.93
A 51.64
9 51.35
8 51.06
7 50.77
6 50.48
5 50.18
4 49.89
3 49.60
2 49.31
1 49.02

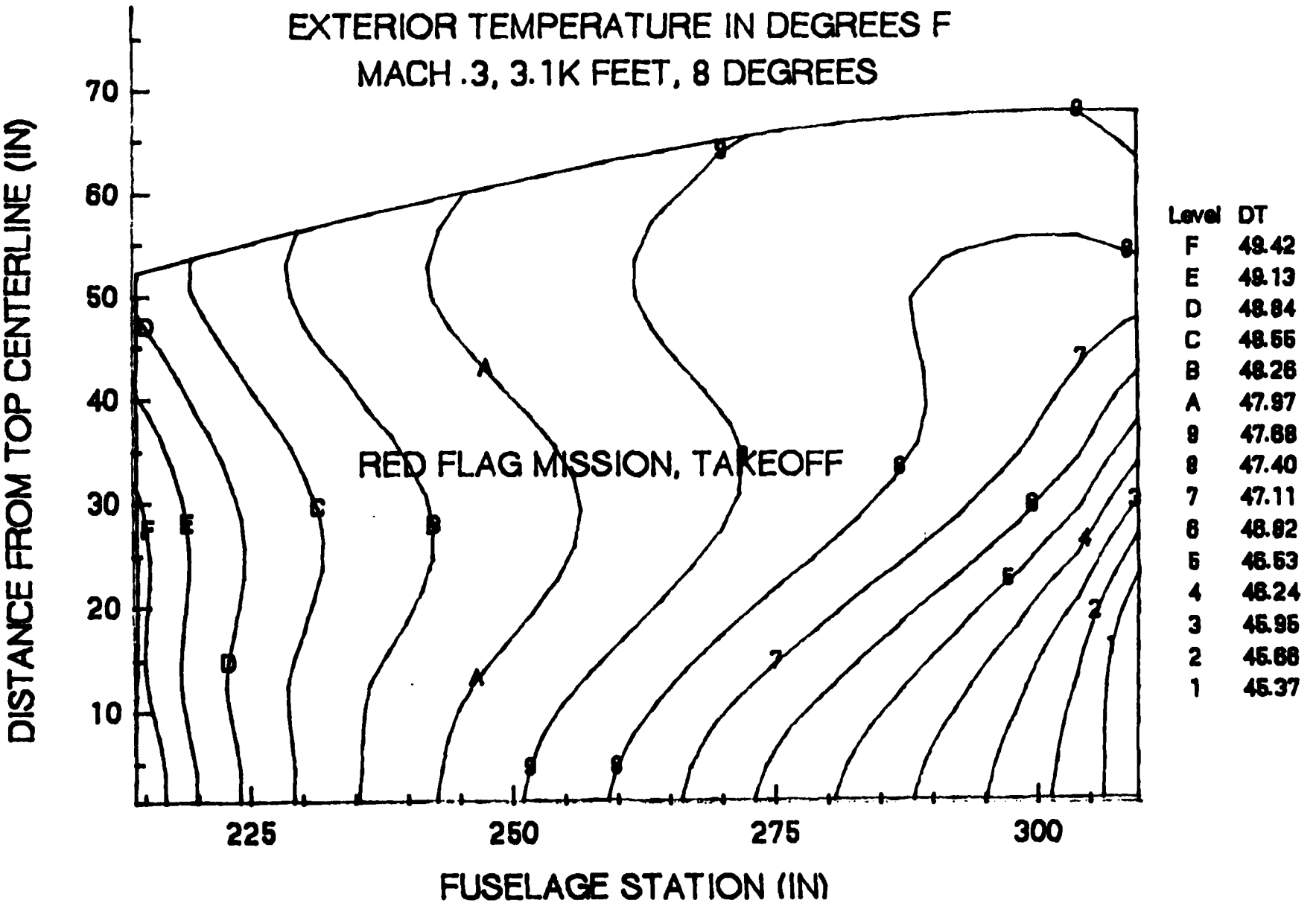
APPENDIX C

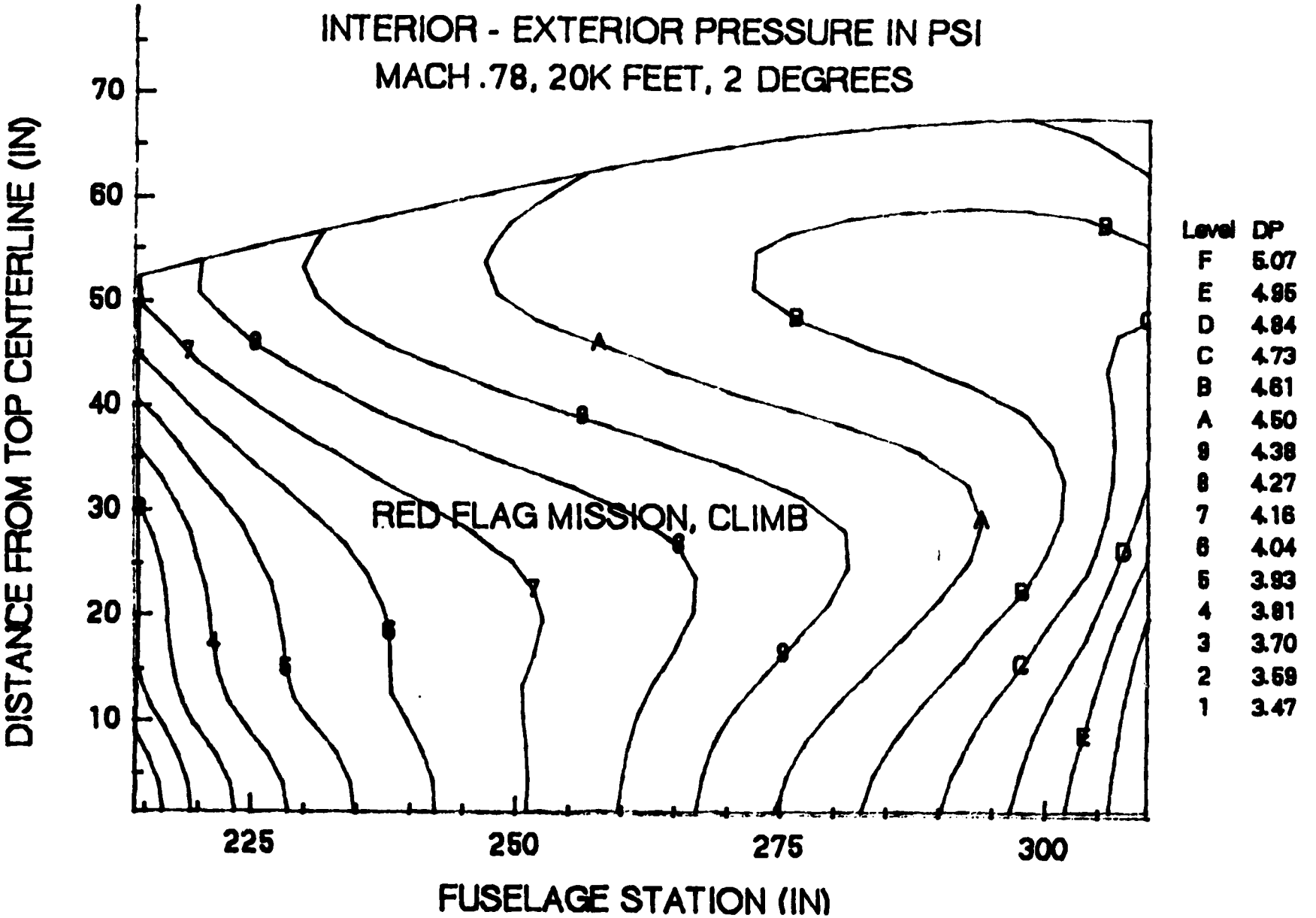
RED FLAG TRAINING MISSION

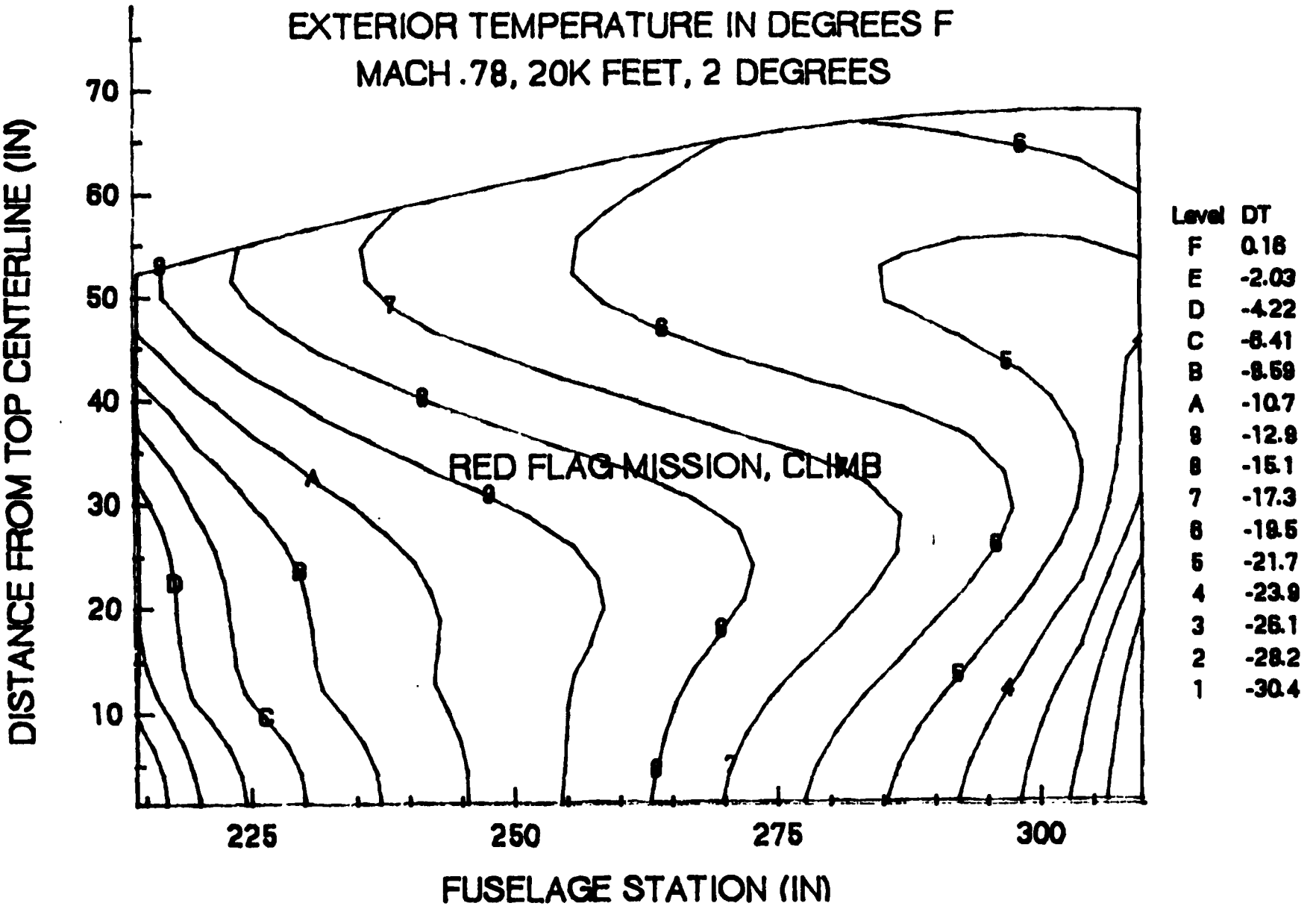
RED FLAG TRAINING MISSION

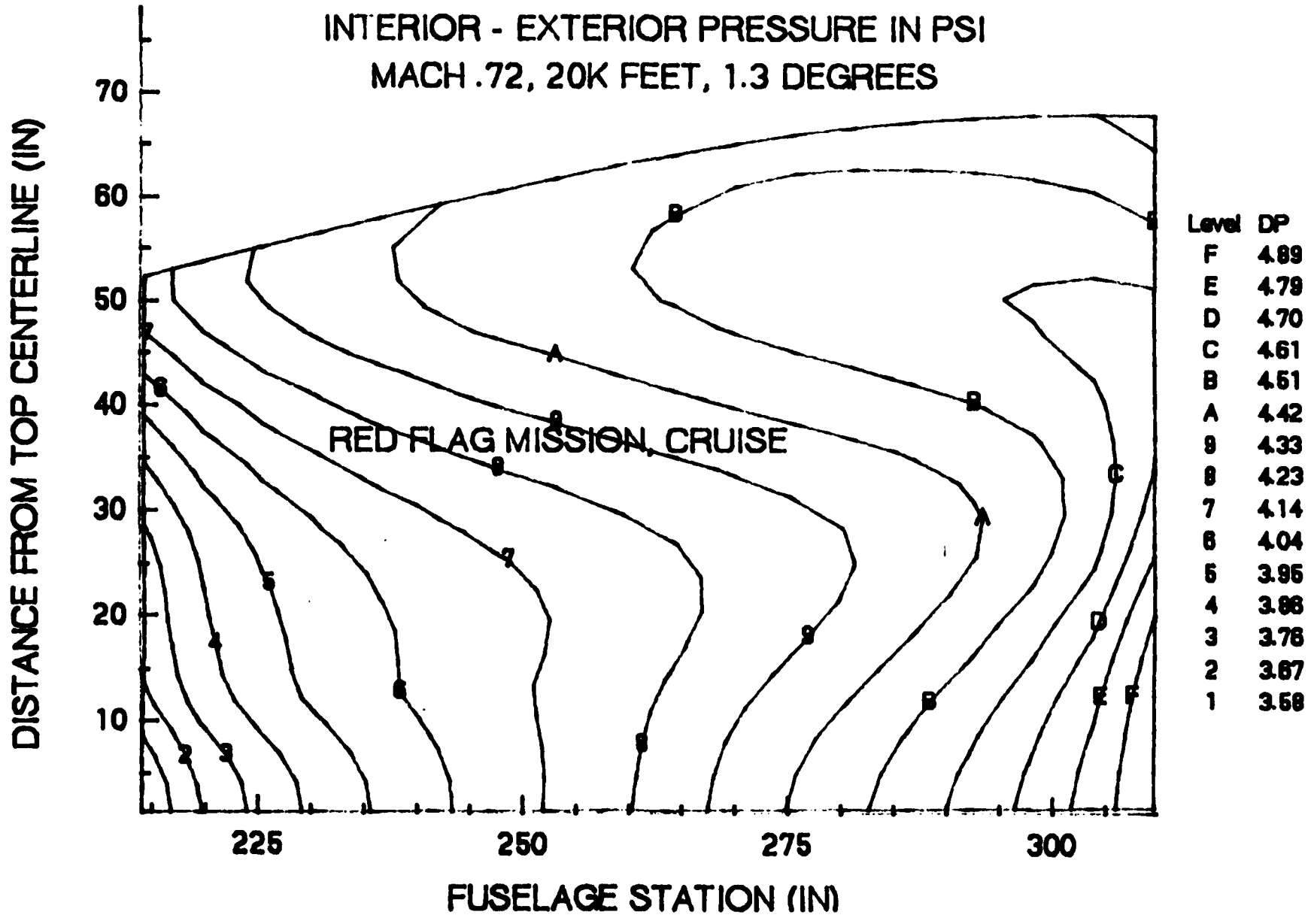
LEG	WING SWEEP (DEGREES)	MACH	ALTITUDE (1000 FT)	ALPHA (DEG)
TAKEOFF	20	.3	3.1	8
CLIMB	25	.78	20	2
CRUISE	25	.72	20	1.3
CRUISE	25	.75	20	1
CRUISE	25	.74	17	.8
INFLIGHT TF CHK	25	.70	10	3
TERRAIN FOLLOW	67.5	.91	10	1.4
TERRAIN FOLLOW	55	.91	10	1.2
TERRAIN FOLLOW	55	.85	10	1.4
CLIMB	55	.72	17	2
CRUISE	25	.74	22	1.1
CRUISE	55	.74	23	.9
CRUISE	25	.74	23	.7
DESCENT	25	.66	4	4
TOUCH & GO/LAND	25	.3	3.1	7

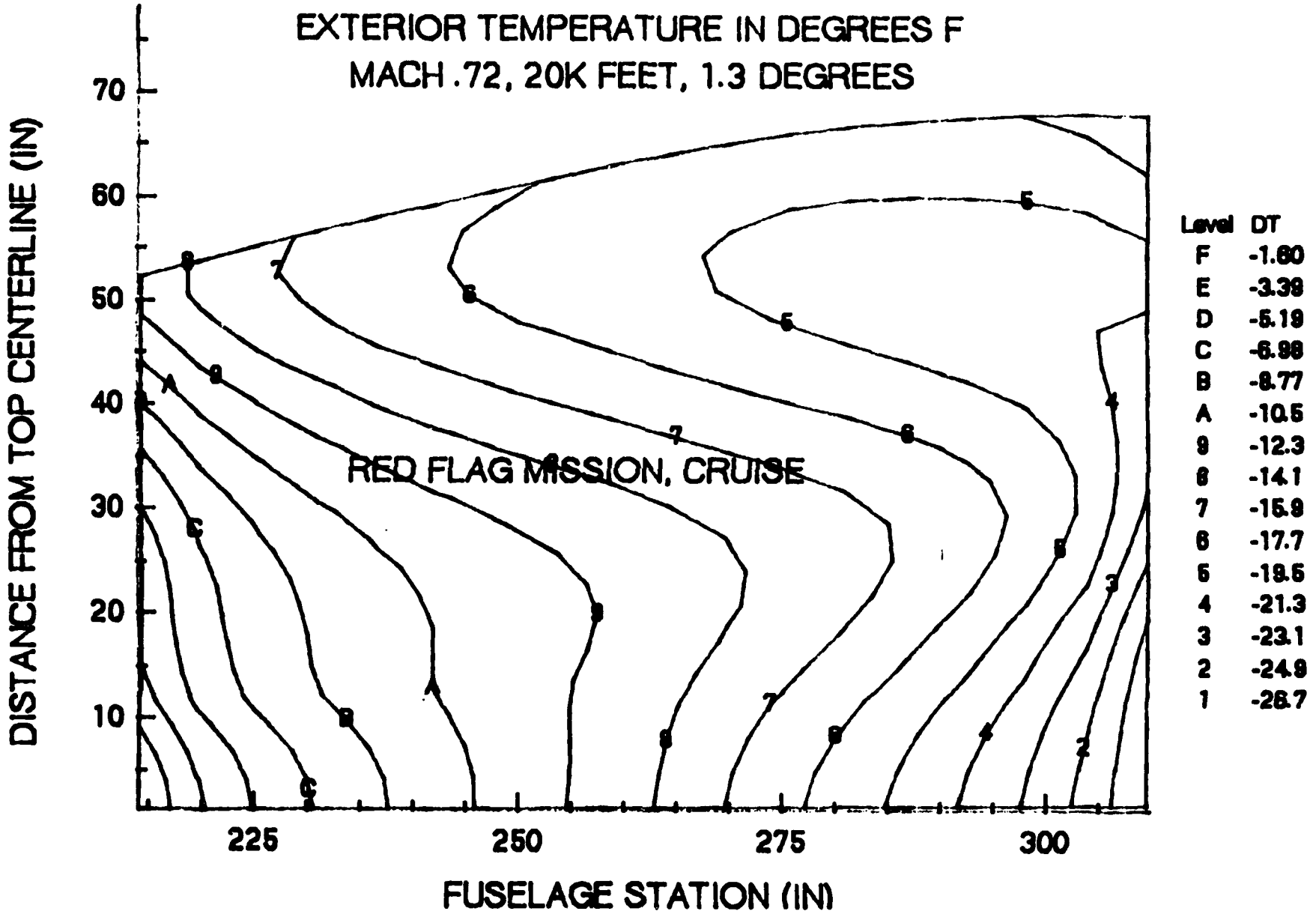

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .3, 3.1K FEET, 8 DEGREES
RED FLAG MISSION, TAKEOFF
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 0.27
E 0.24
D 0.22
C 0.19
B 0.17
A 0.14
9 0.11
8 0.09
7 0.06
6 0.03
5 0.01
4 -0.02
3 -0.04
2 -0.07
1 -0.10

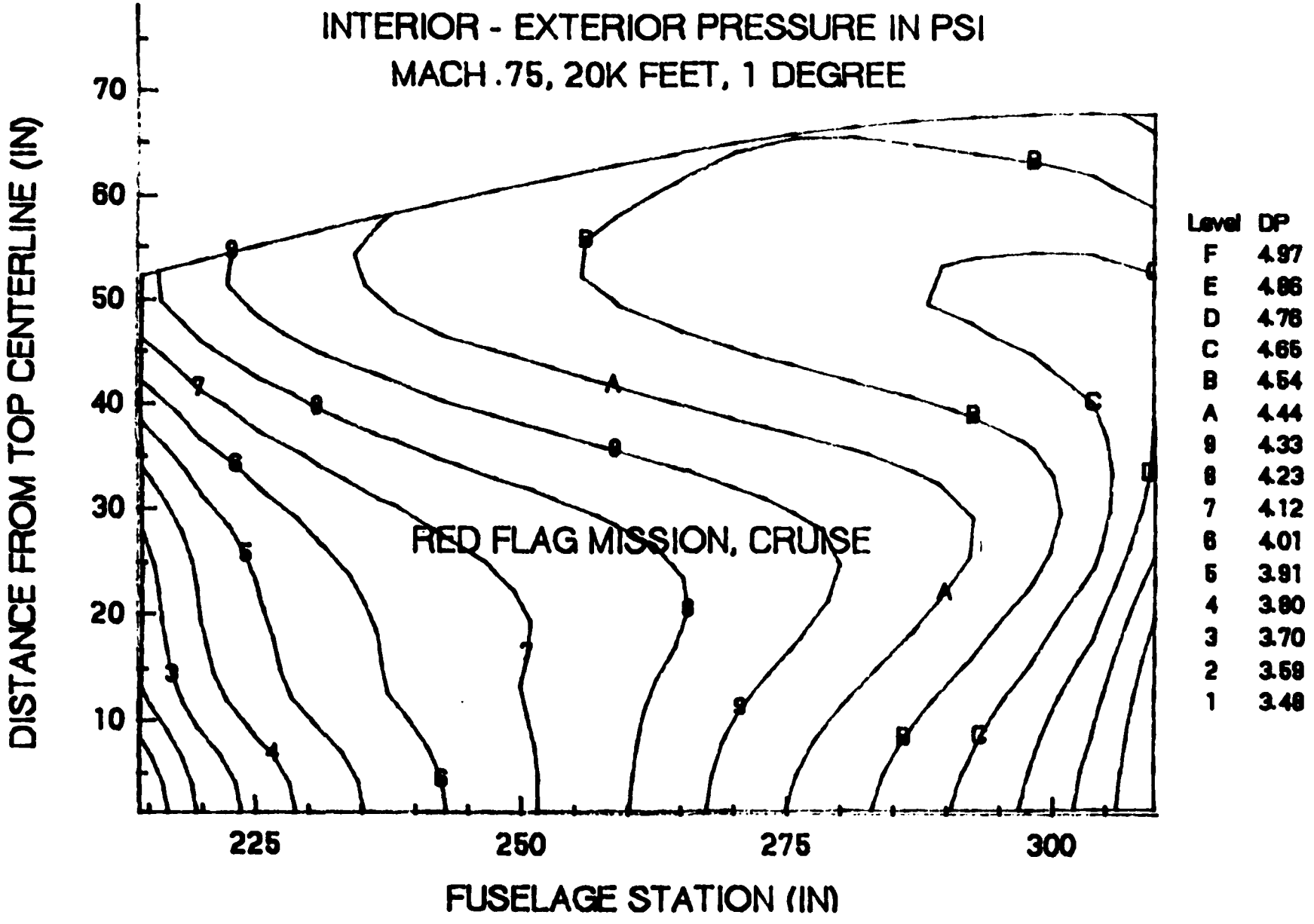

EXTERIOR TEMPERATURE IN DEGREES F
MACH .3, 3.1K FEET, 8 DEGREES
RED FLAG MISSION, TAKEOFF
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 49.42
E 49.13
D 48.84
C 48.55
B 48.26
A 47.97
9 47.68
8 47.40
7 47.11
6 46.82
5 46.53
4 46.24
3 45.95
2 45.66
1 45.37

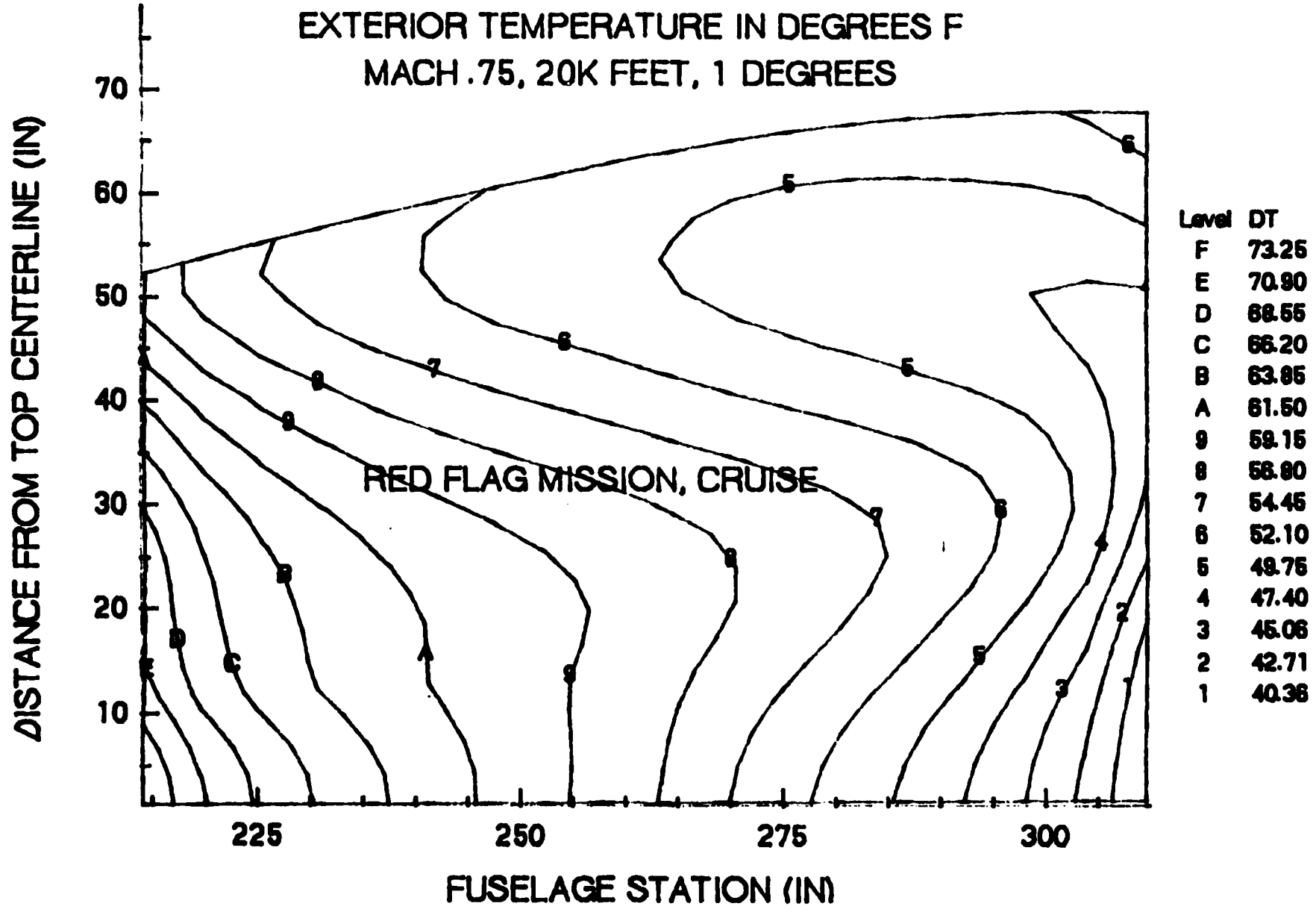

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .78, 20K FEET, 2 DEGREES
RED FLAG MISSION, CLIMB
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 5.07
E 4.95
D 4.84
C 4.73
B 4.61
A 4.50
9 4.38
8 4.27
7 4.16
6 4.04
5 3.93
4 3.81
3 3.70
2 3.59
1 3.47

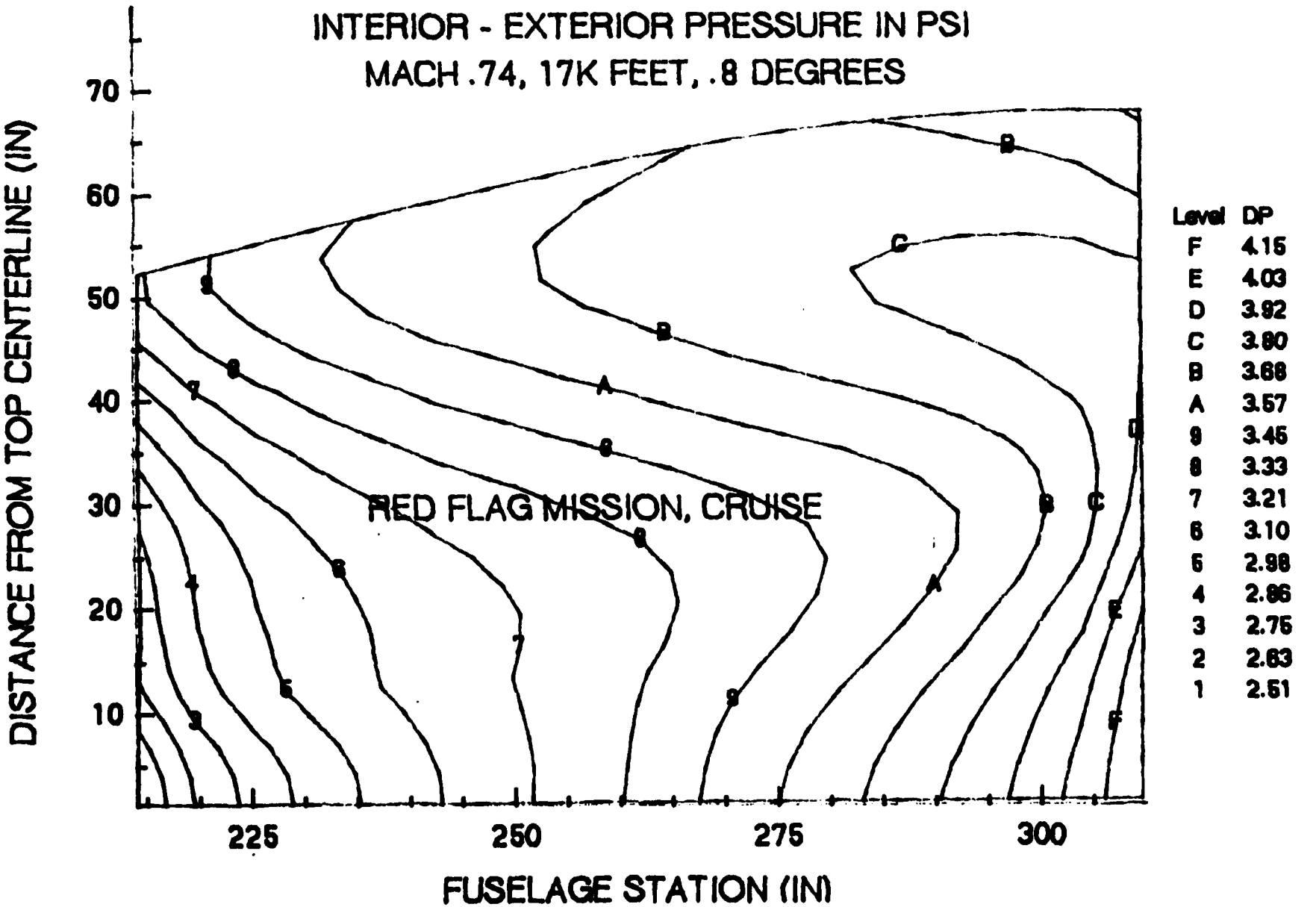

EXTERIOR TEMPERATURE IN DEGREES F
MACH .78, 20K FEET, 2 DEGREES
RED FLAG MISSION, CLIMB
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 0.16
E -2.03
D -4.22
C -6.41
B -8.59
A -10.7
9 -12.9
8 -15.1
7 -17.3
6 -19.5
5 -21.7
4 -23.9
3 -26.1
2 -28.2
1 -30.4

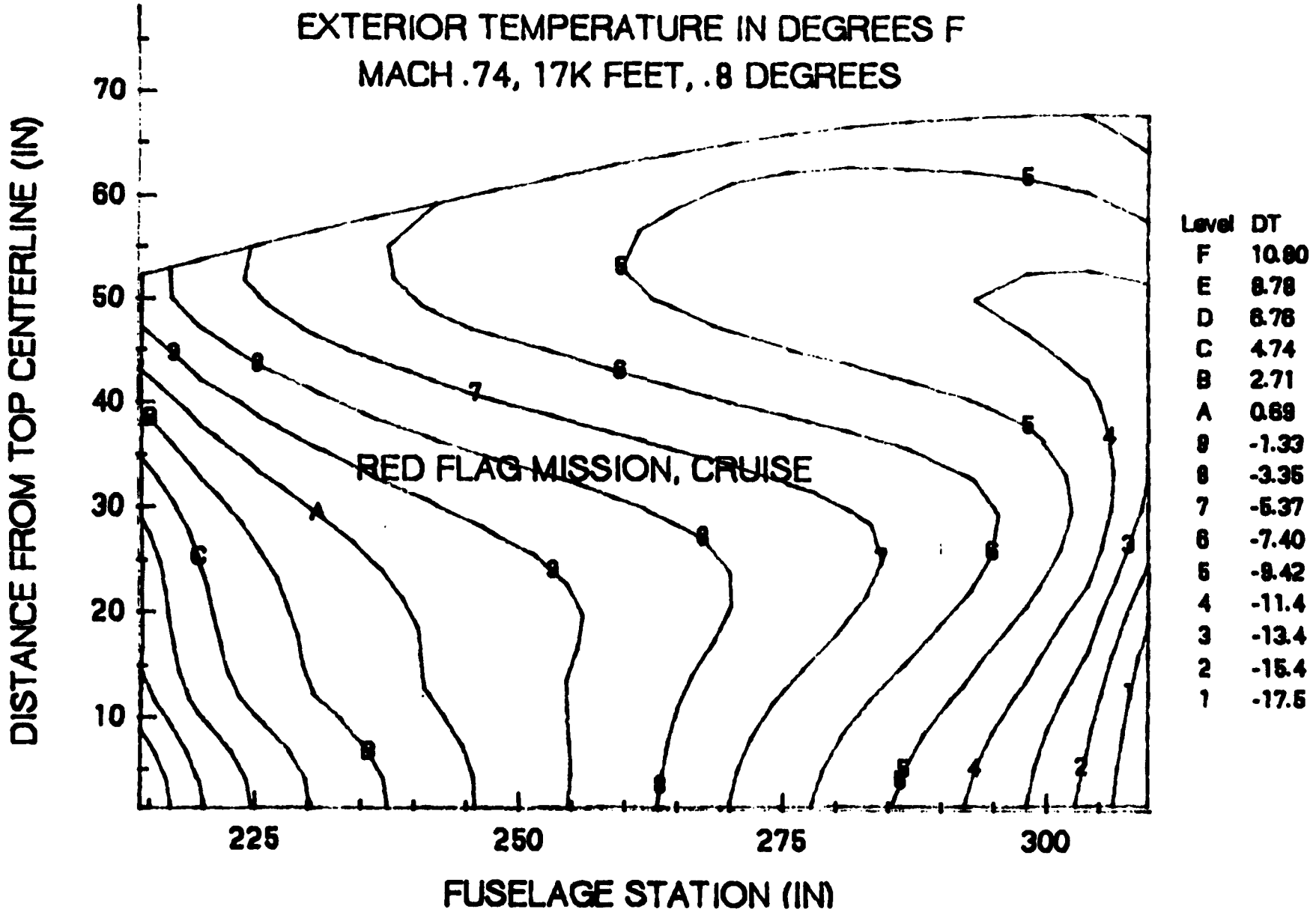

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 20K FEET, 1.3 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.89
E 4.79
D 4.70
C 4.61
B 4.51
A 4.42
9 4.33
8 4.23
7 4.14
6 4.04
5 3.95
4 3.86
3 3.76
2 3.67
1 3.58

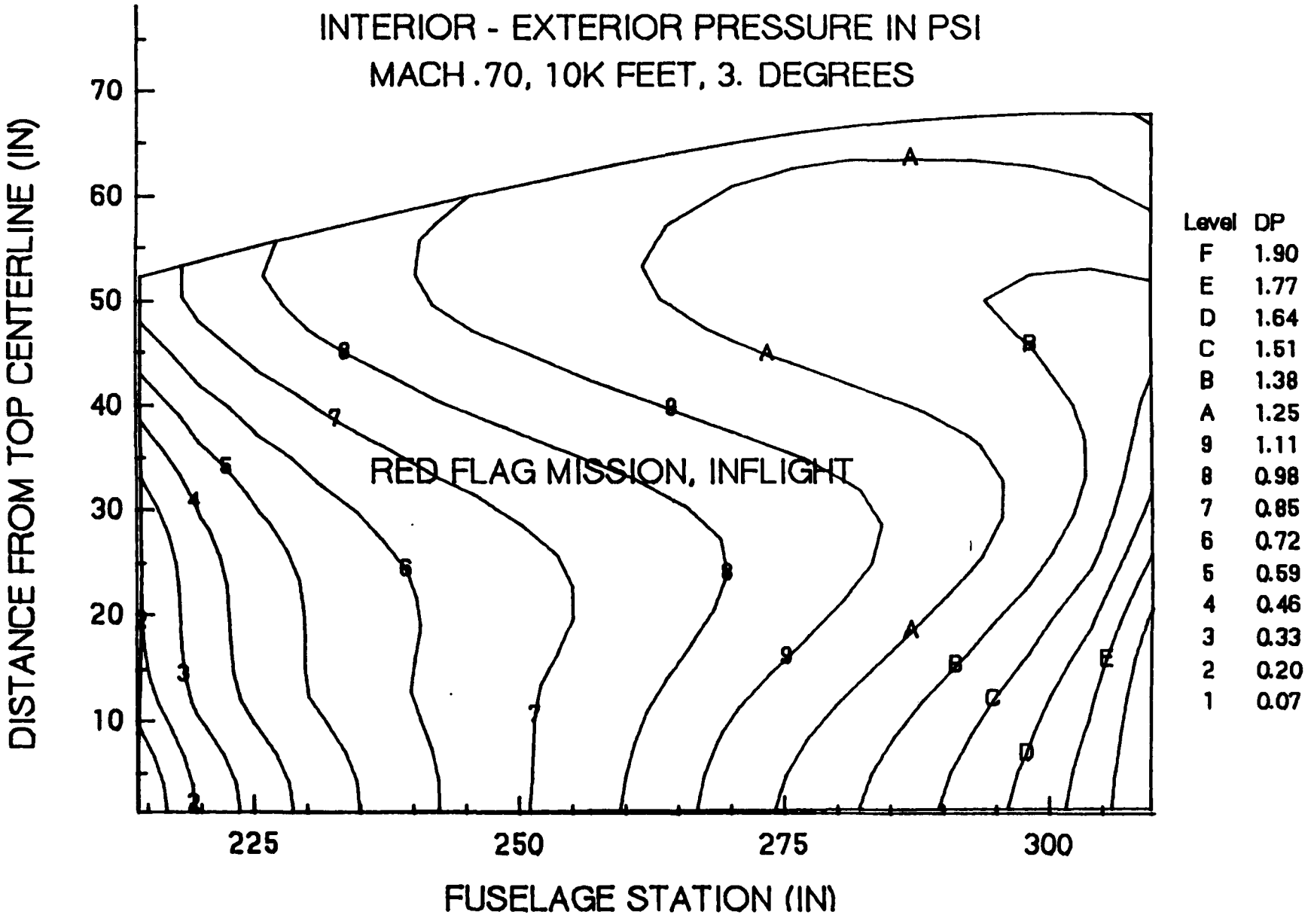

EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 20K FEET, 1.3 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F -1.60
E -3.39
D -5.19
C -6.98
B -8.77
A -10.5
9 -12.3
8 -14.1
7 -15.9
6 -17.7
5 -19.5
4 -21.3
3 -23.1
2 -24.9
1 -26.7

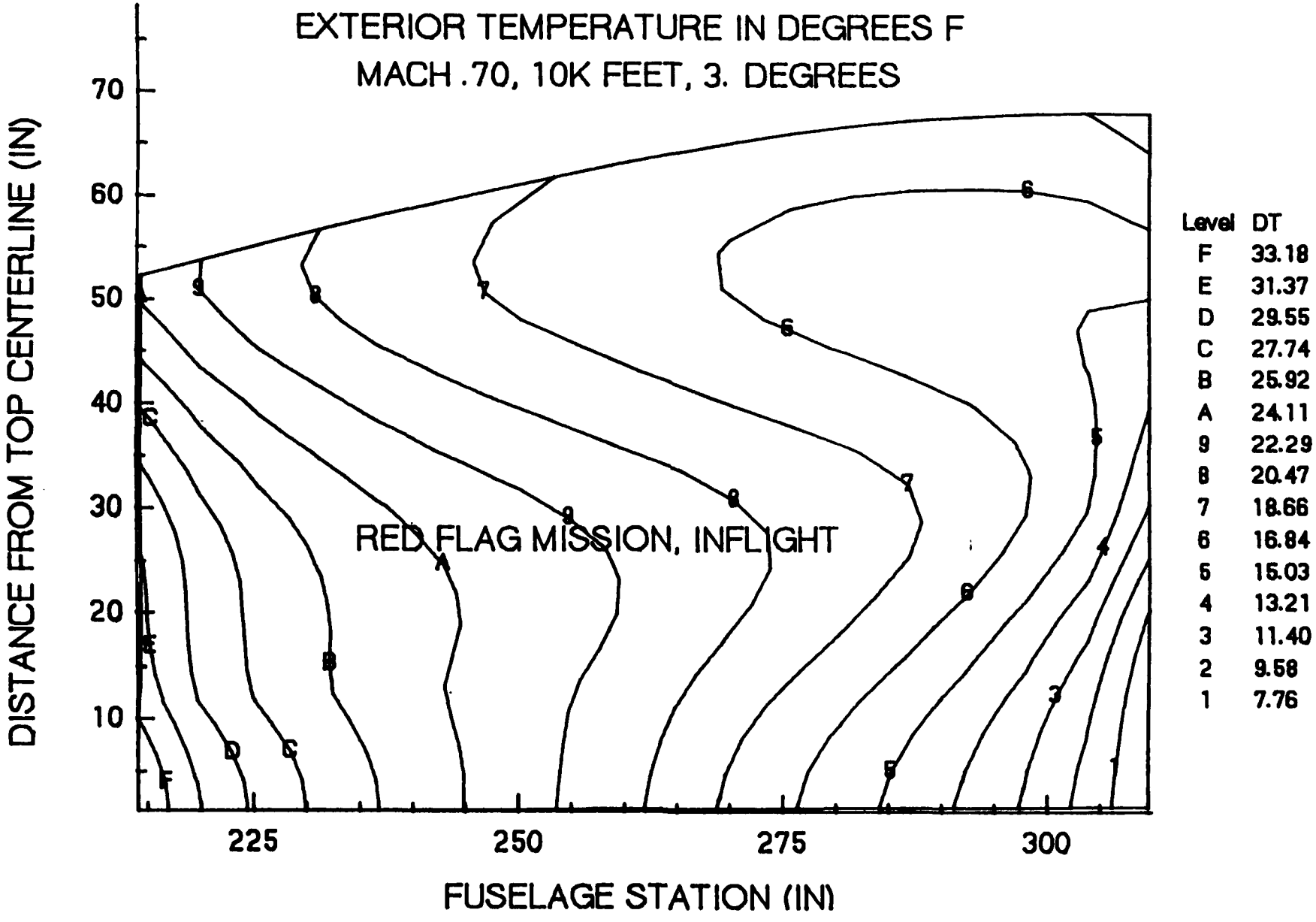

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .75, 20K FEET, 1 DEGREE
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.97
E 4.86
D 4.76
C 4.65
B 4.54
A 4.44
9 4.33
8 4.23
7 4.12
6 4.01
5 3.91
4 3.80
3 3.70
2 3.59
1 3.48

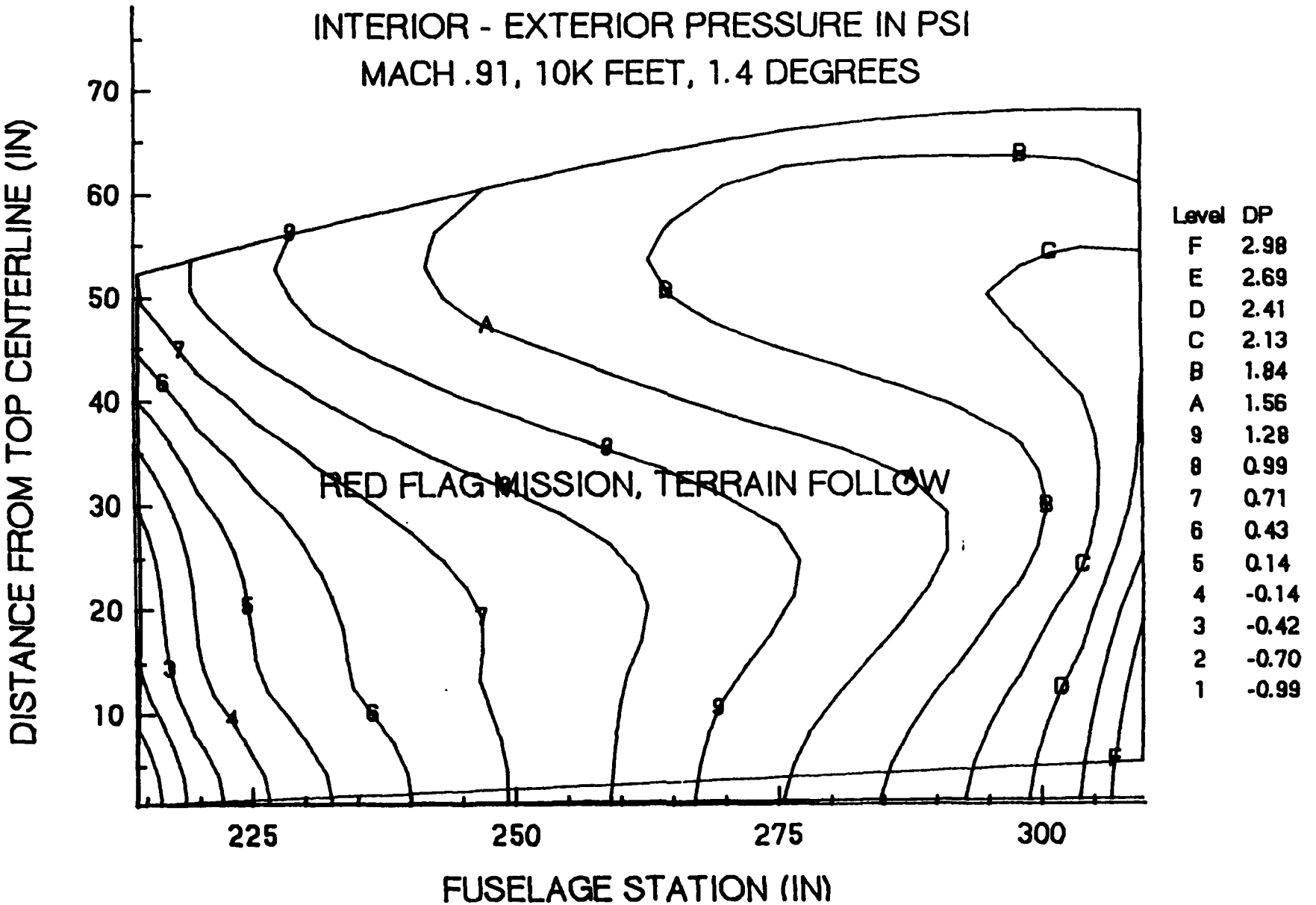

EXTERIOR TEMPERATURE IN DEGREES F
MACH .75, 20K FEET, 1 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 73.25
E 70.90
D 68.55
C 66.20
B 63.85
A 61.50
9 59.15
8 58.80
7 54.45
6 52.10
5 49.75
4 47.40
3 45.06
2 42.71
1 40.36

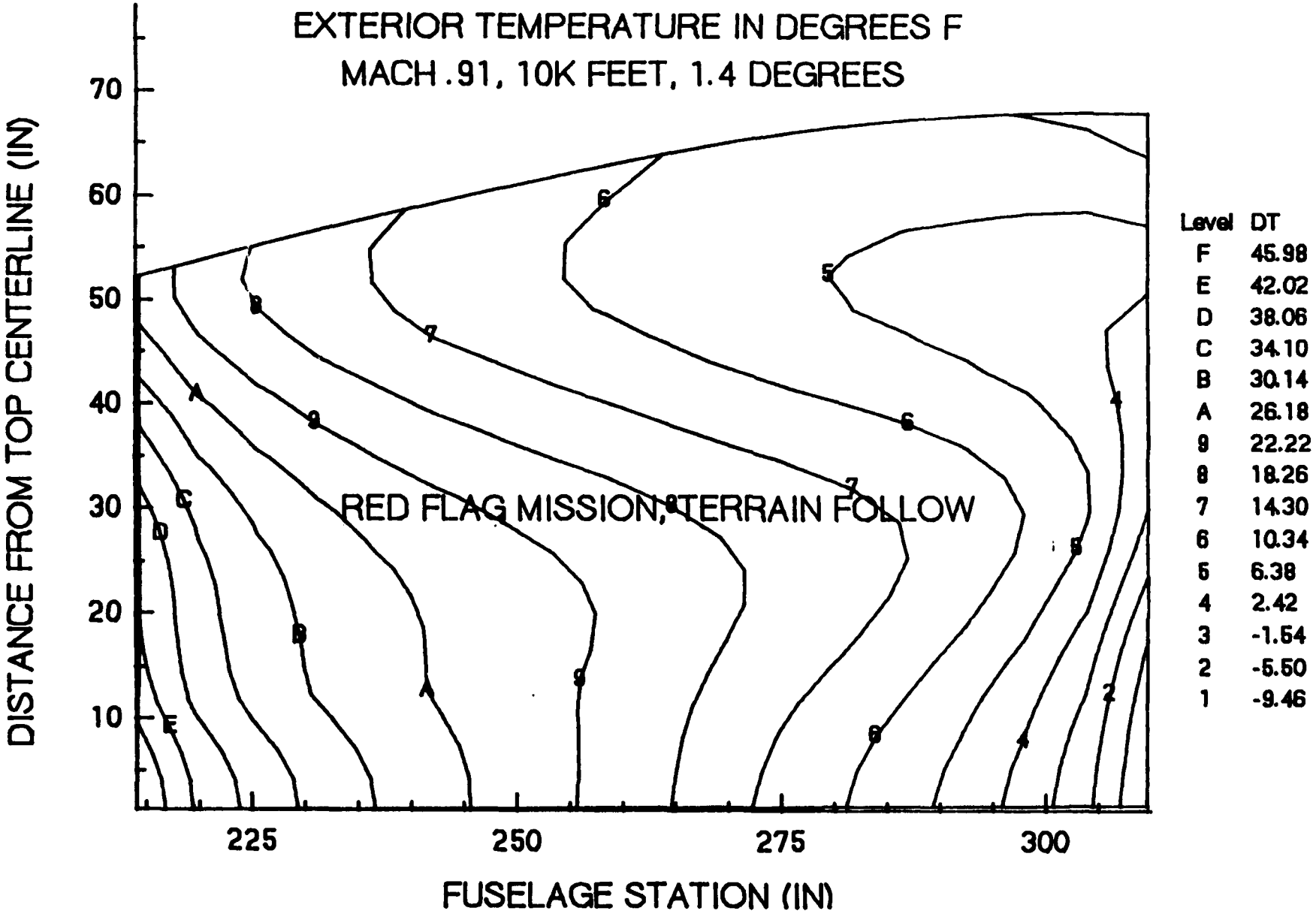

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .74, 17K FEET, .8 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 4.15
E 4.03
D 3.92
C 3.80
B 3.68
A 3.57
9 3.45
8 3.33
7 3.21
6 3.10
5 2.98
4 2.86
3 2.75
2 2.63
1 2.51

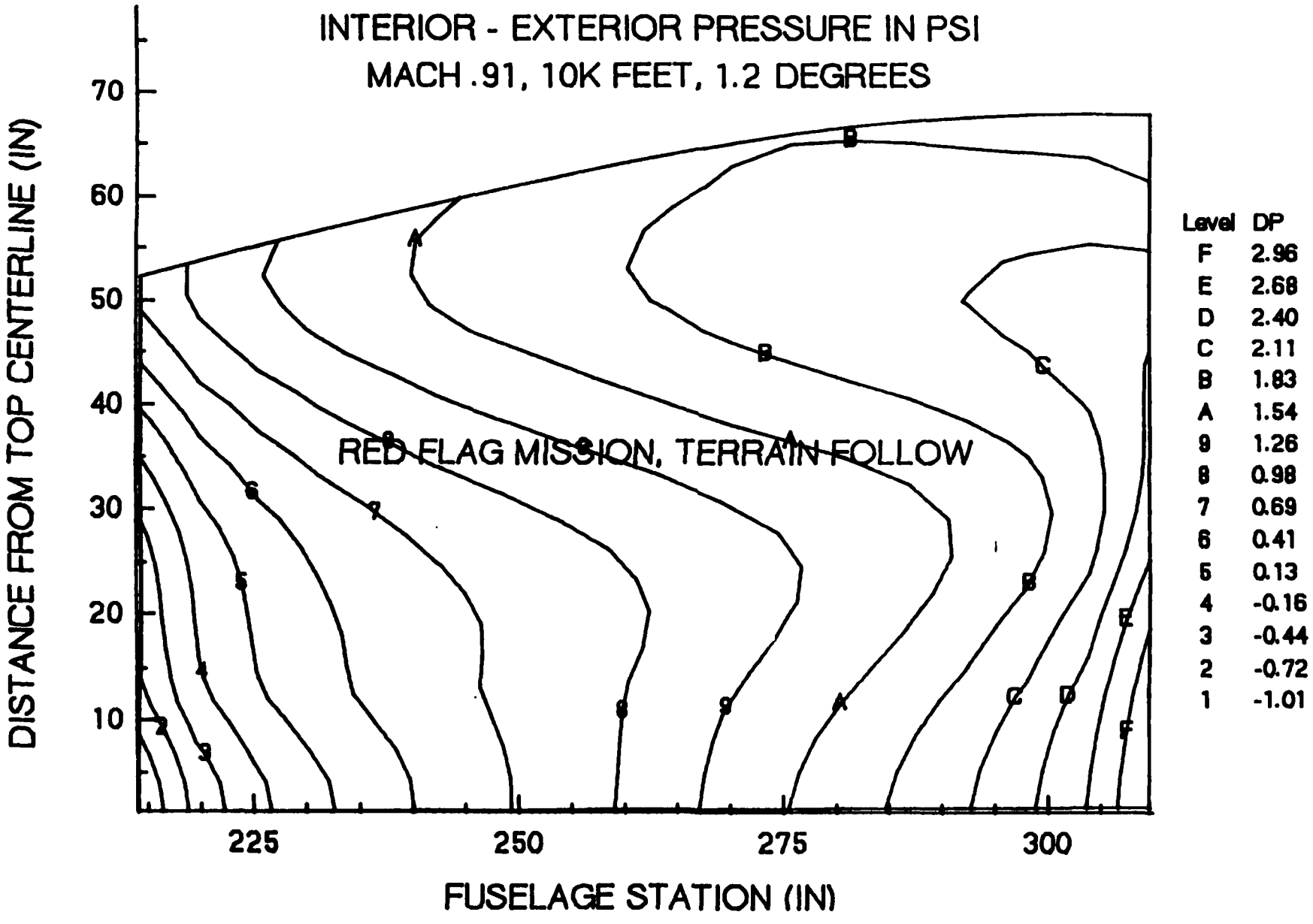

EXTERIOR TEMPERATURE IN DEGREES F
MACH .74, 17K FEET, .8 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 10.80
E 8.78
D 6.76
C 4.74
B 2.71
A 0.69
9 -1.33
8 -3.35
7 -5.37
6 -7.40
5 -9.42
4 -11.4
3 -13.4
2 -15.4
1 -17.5

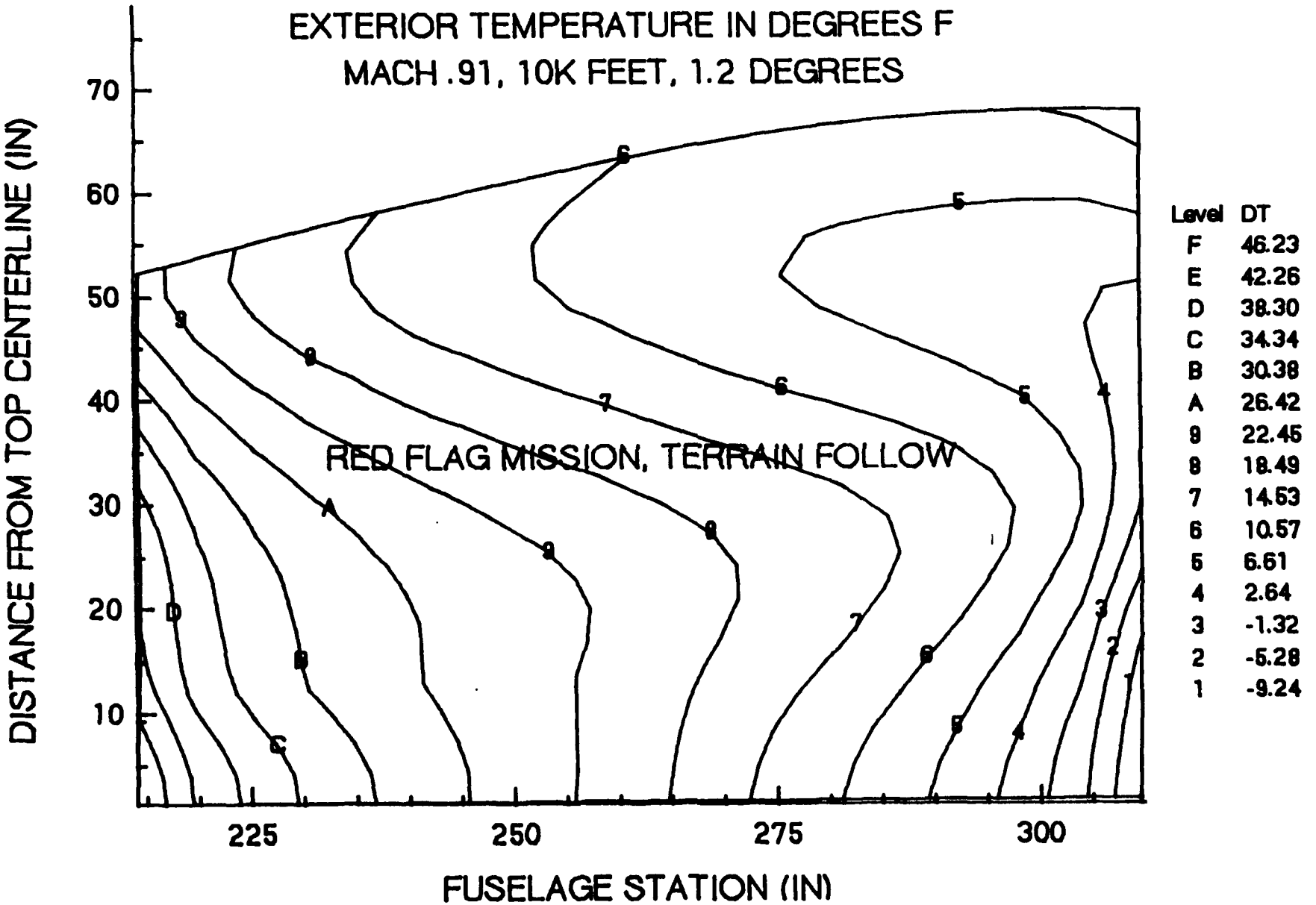

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .70, 10K FEET, 3. DEGREES
RED FLAG MISSION, INFLIGHT
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 1.90
E 1.77
D 1.64
C 1.61
B 1.38
A 1.25
9 1.11
8 0.98
7 0.85
6 0.72
5 0.59
4 0.46
3 0.33
2 0.20
1 0.07

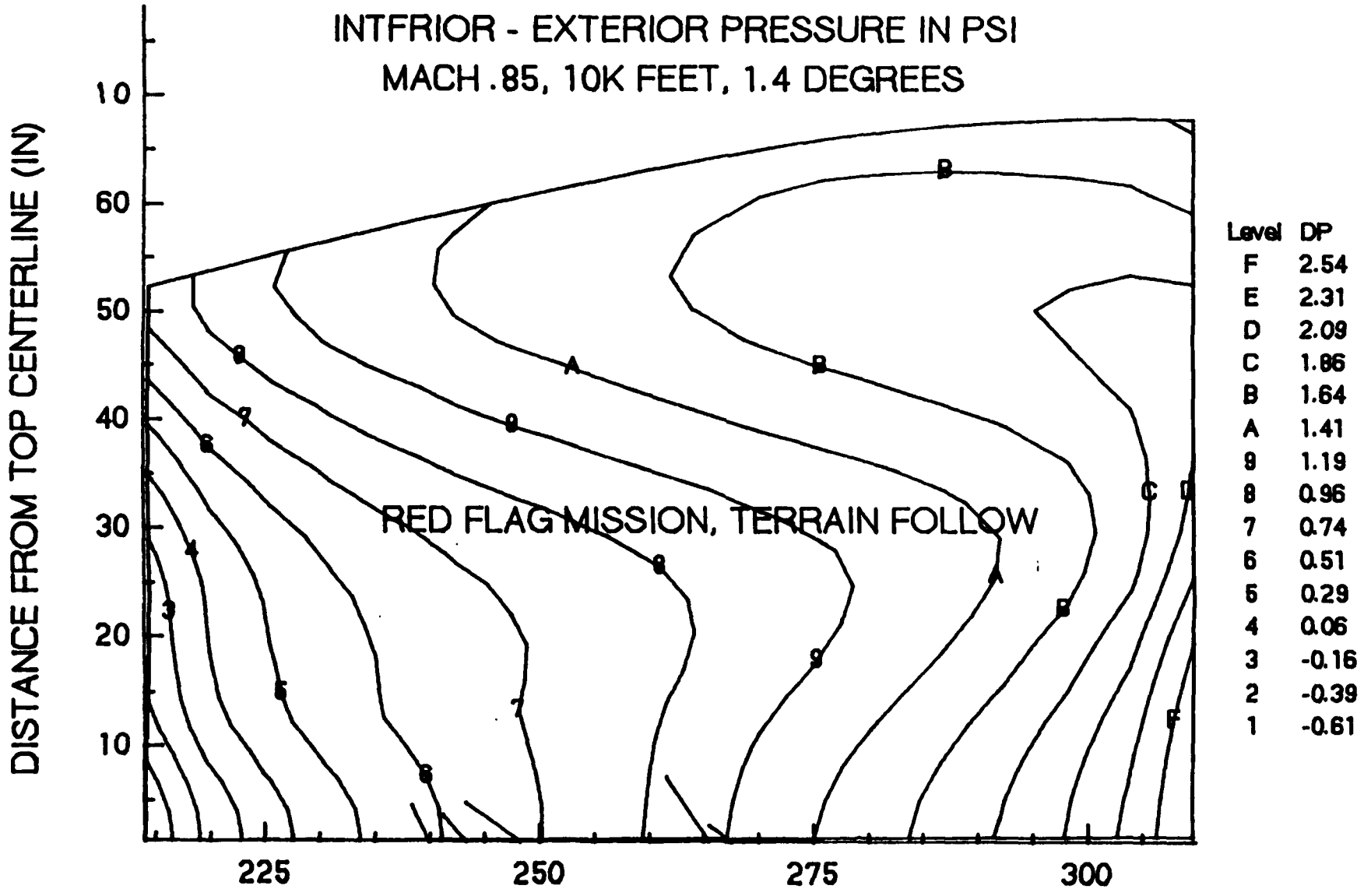

EXTERIOR TEMPERATURE IN DEGREES F
MACH .70, 10K FEET, 3. DEGREES
RED FLAG MISSION, INFLIGHT
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 33.18
E 31.37
D 29.55
C 27.74
B 25.92
A 24.11
9 22.29
8 20.47
7 18.66
6 16.84
5 15.03
4 13.21
3 11.40
2 9.58
1 7.76

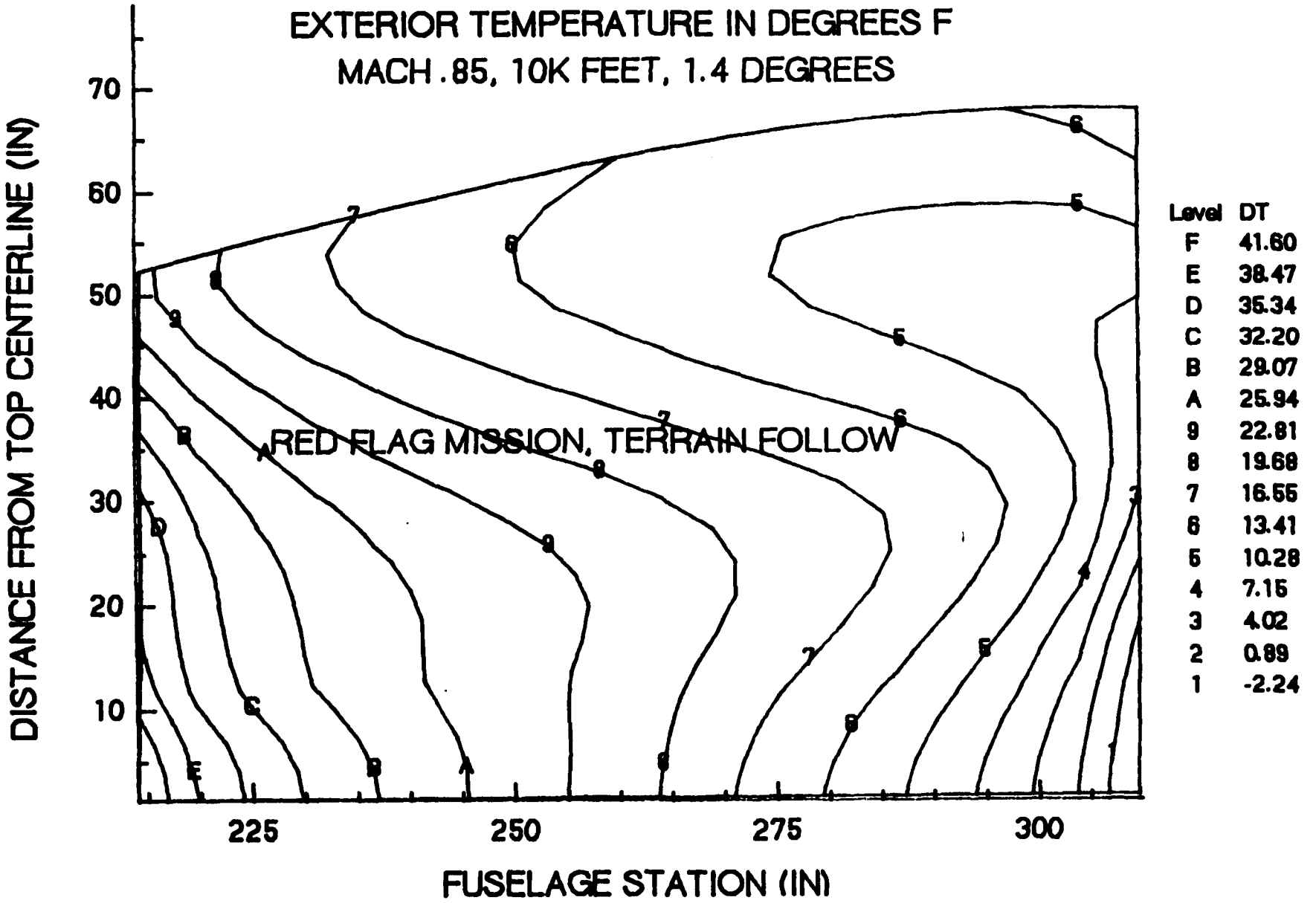

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .91, 10K FEET, 1.4 DEGREES
RED FLAG MISSION, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 2.98
E 2.69
D 2.41
C 2.13
B 1.84
A 1.56
9 1.28
8 0.99
7 0.71
6 0.43
5 0.14
4 -0.14
3 -0.42
2 -0.70
1 -0.99

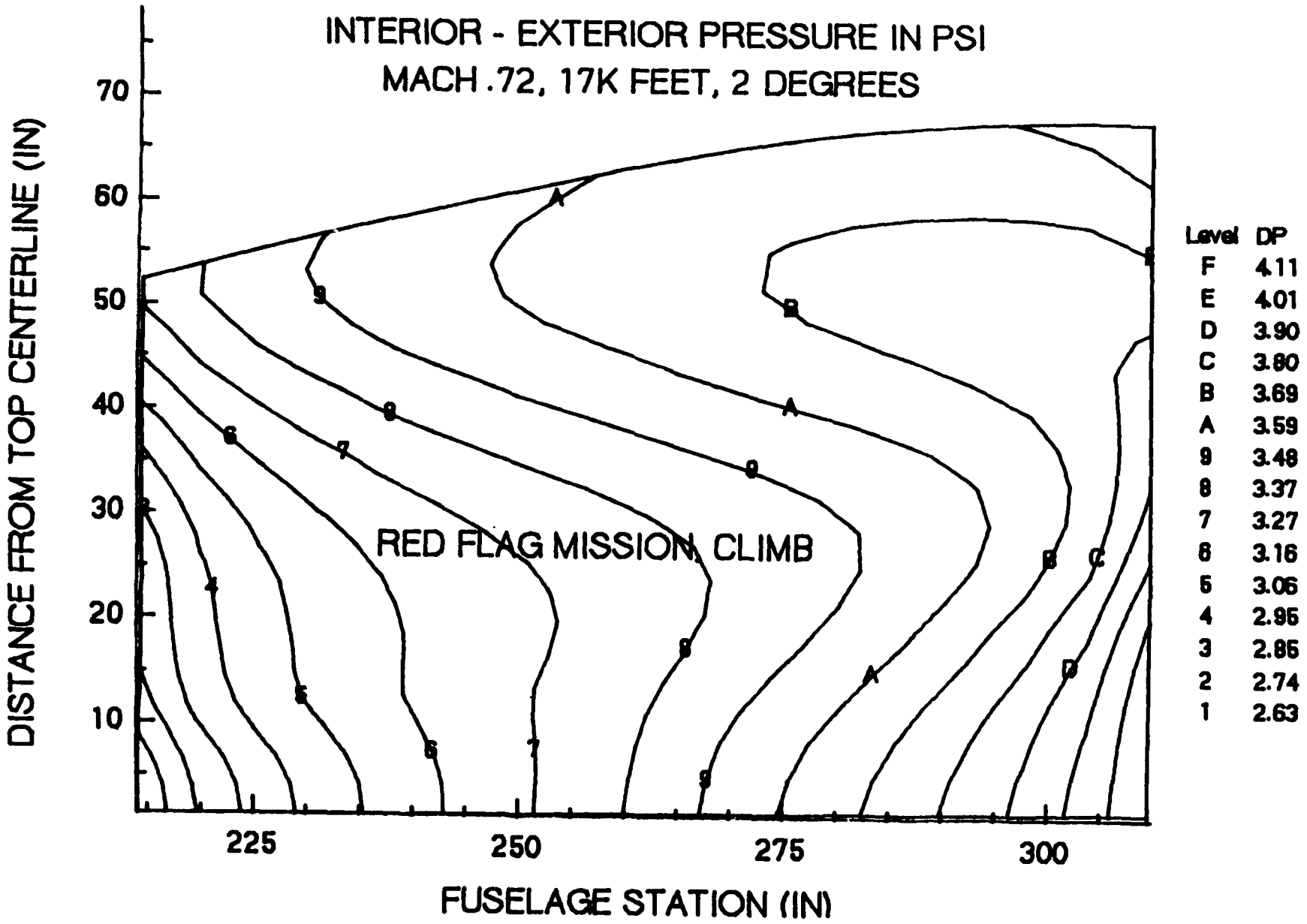

EXTERIOR TEMPERATURE IN DEGREES F
MACH .91, 10K FEET, 1.4 DEGREES
RED FLAG MISSION, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 45.98
E 42.02
D 38.06
C 34.10
B 30.14
A 26.18
9 22.22
8 18.26
7 14.30
6 10.34
5 6.38
4 2.42
3 -1.54
2 -5.50
1 -9.46

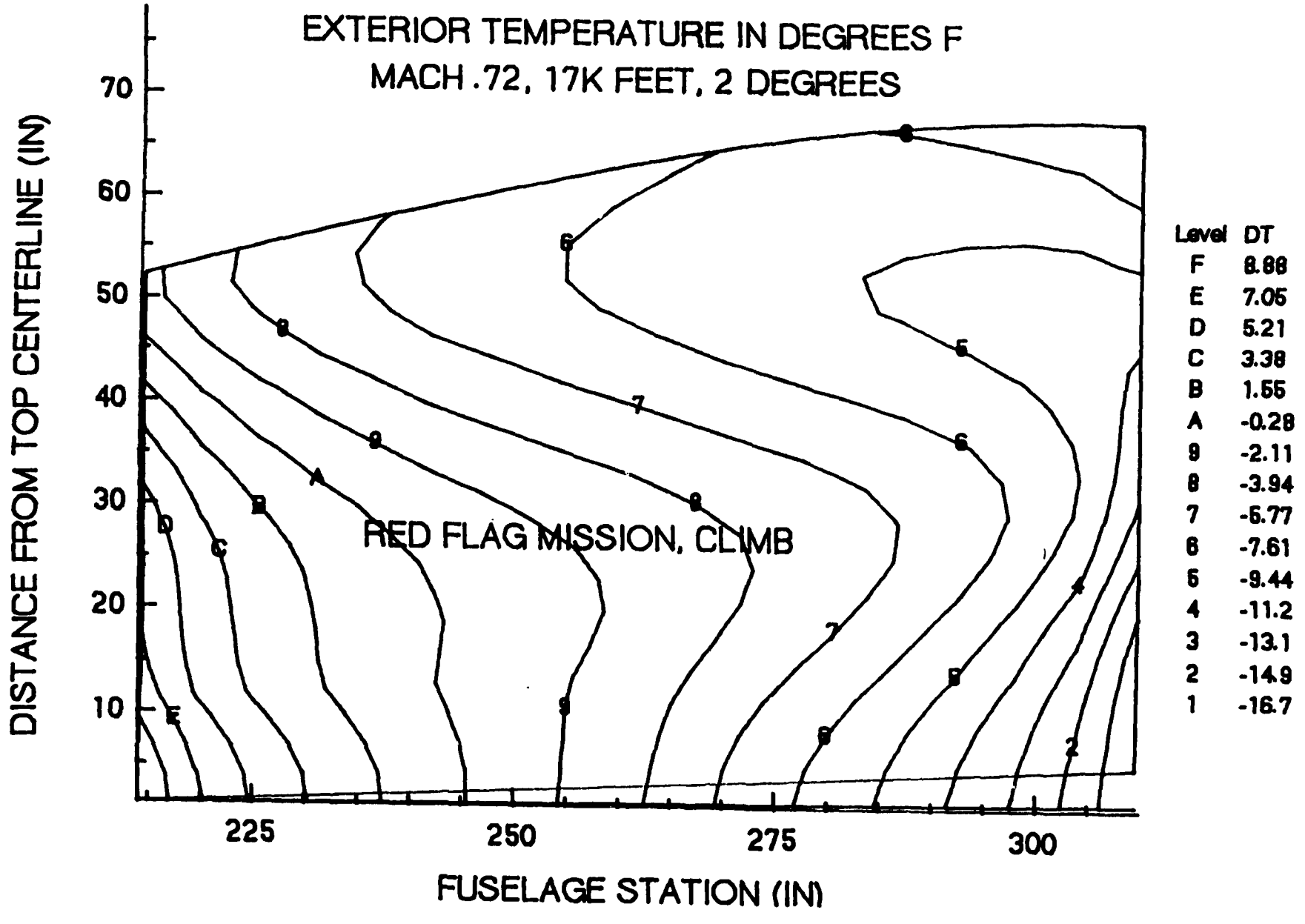

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .91, 10K FEET, 1.2 DEGREES
RED FLAG MISSION, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 2.96
E 2.68
D 2.40
C 2.11
B 1.83
A 1.54
9 1.26
8 0.98
7 0.69
6 0.41
5 0.13
4 -0.16
3 -0.44
2 -0.72
1 -1.01

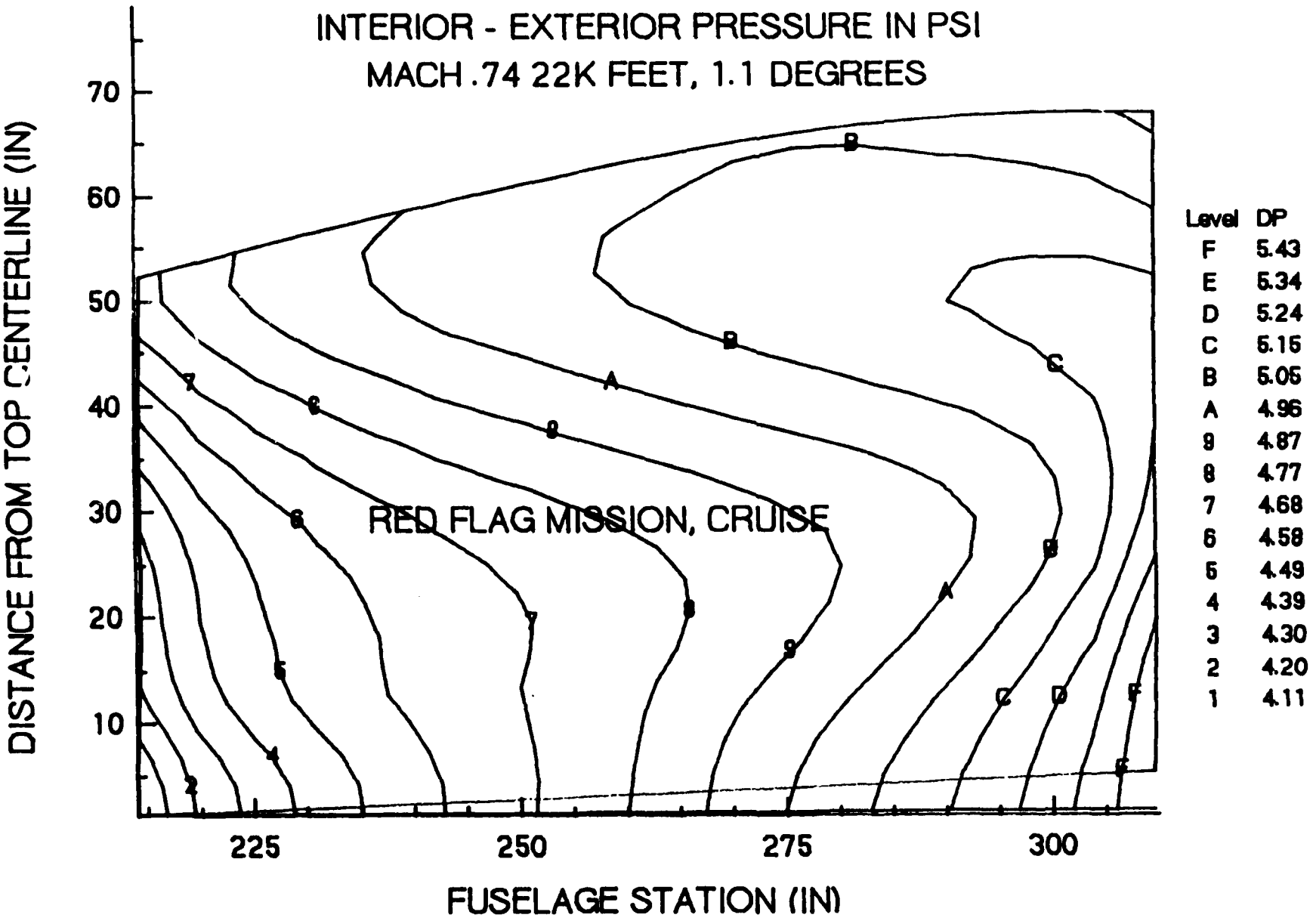

EXTERIOR TEMPERATURE IN DEGREES F
MACH .91, 10K FEET, 1.2 DEGREES
RED FLAG MISSION, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 46.23
E 42.26
D 38.30
C 34.34
B 30.38
A 26.42
9 22.45
8 18.49
7 14.53
6 10.57
5 6.61
4 2.64
3 -1.32
2 -5.28
1 -9.24

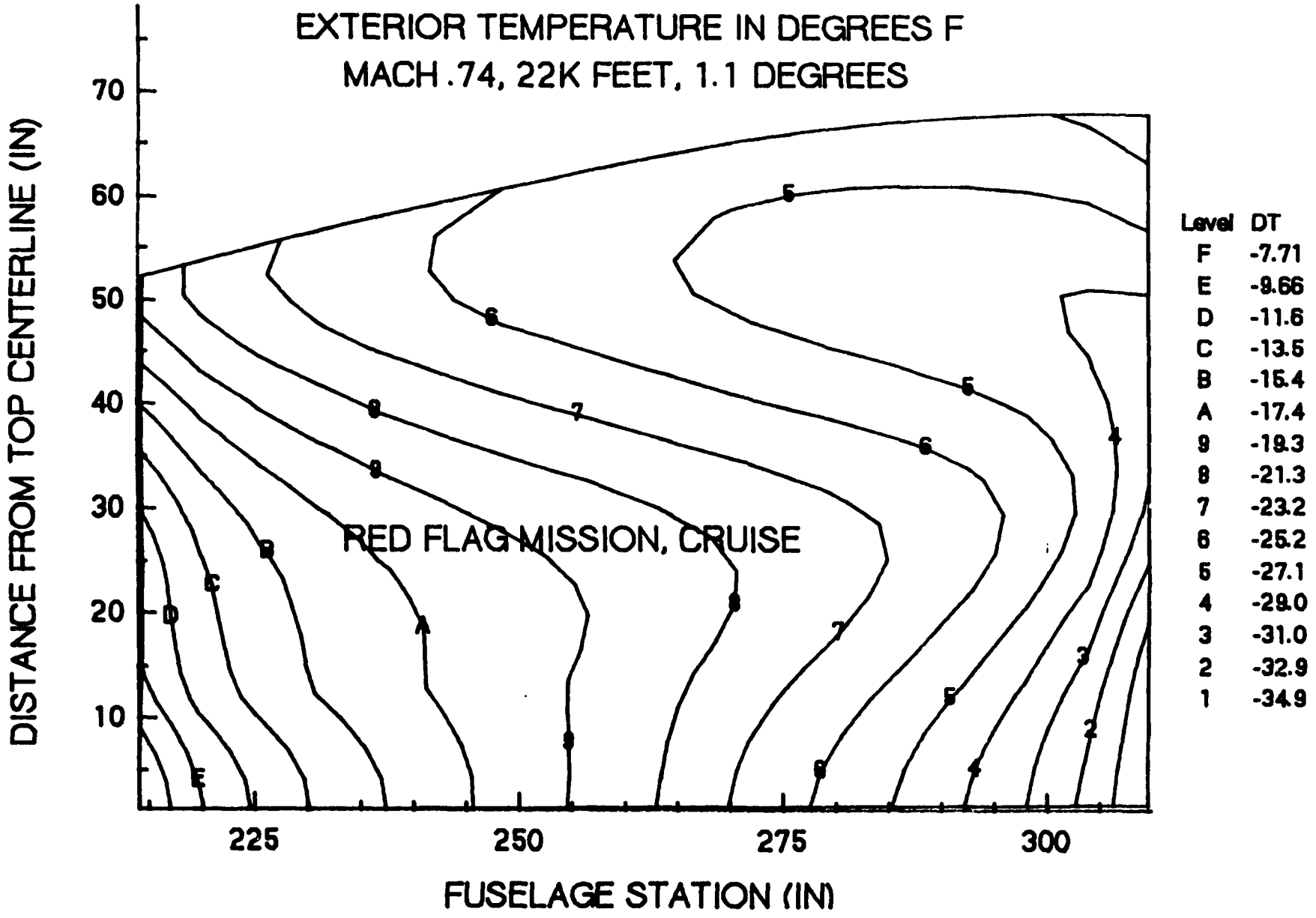

INTFRIOR - EXTERIOR PRESSURE IN PSI
MACH .85, 10K FEET, 1.4 DEGREES
RED FLAG MISSION, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
10
60
50
40
30
20
10
225
250
275
300
Level DP
F 2.54
E 2.31
D 2.09
C 1.86
B 1.64
A 1.41
9 1.19
8 0.96
7 0.74
6 0.51
5 0.29
4 0.06
3 -0.16
2 -0.39
1 -0.61

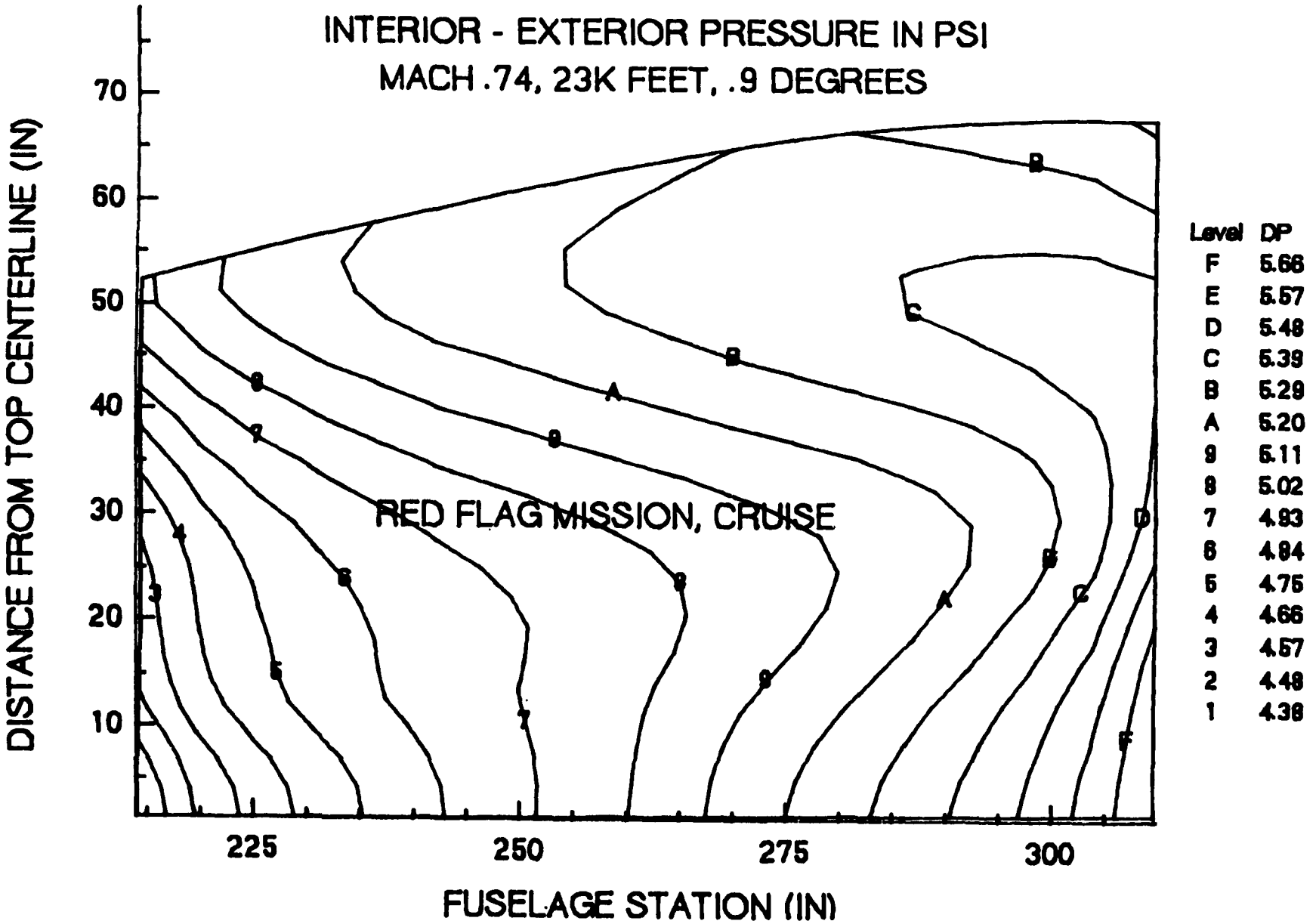

EXTERIOR TEMPERATURE IN DEGREES F
MACH .85, 10K FEET, 1.4 DEGREES
RED FLAG MISSION, TERRAIN FOLLOW
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 41.60
E 38.47
D 35.34
C 32.20
B 29.07
A 25.94
9 22.81
8 19.68
7 16.55
6 13.41
5 10.28
4 7.15
3 4.02
2 0.89
1 -2.24

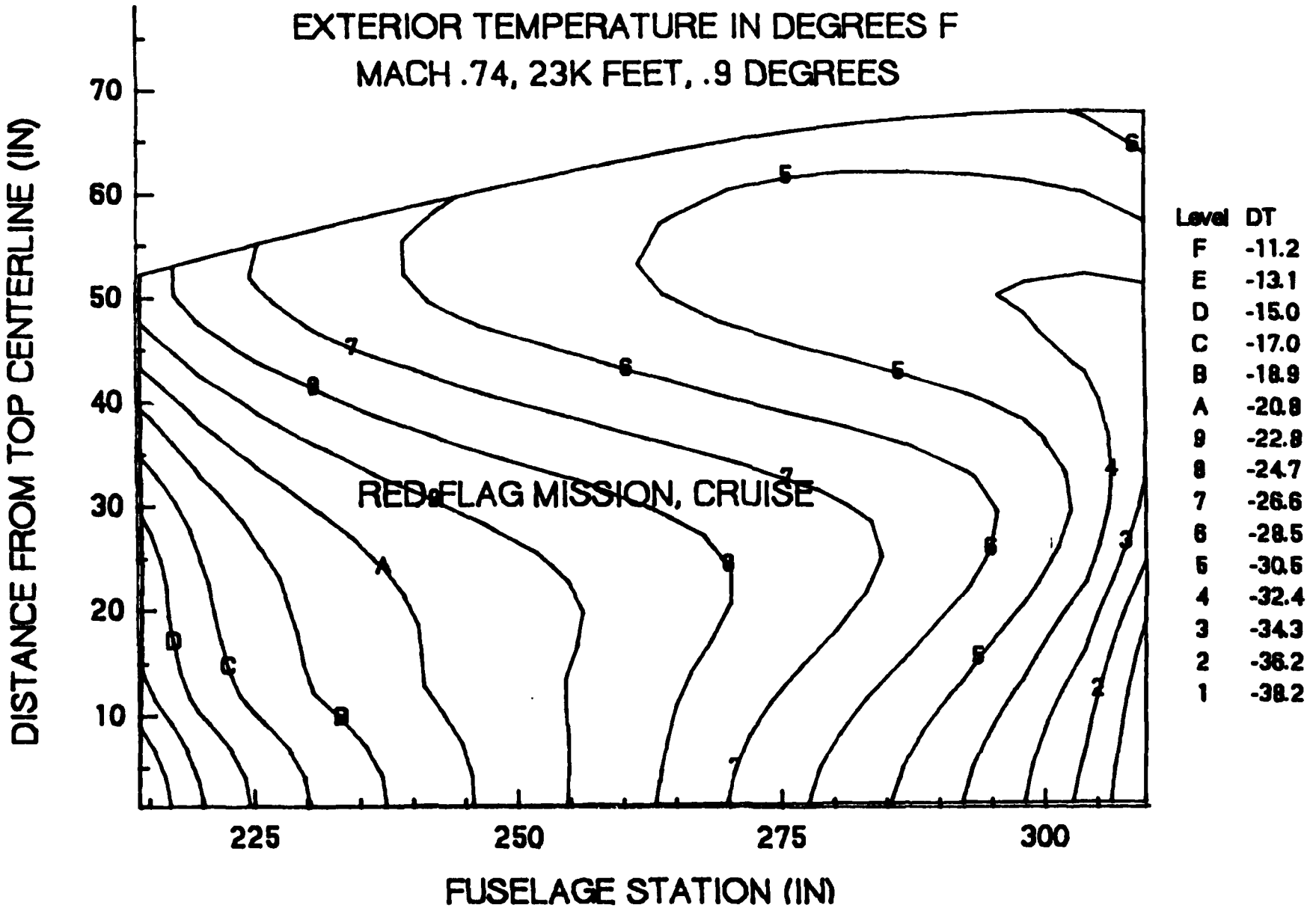

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .72, 17K FEET, 2 DEGREES
RED FLAG MISSION, CLIMB
DISTANCE FROM TOP CENTERLINE (IN)
FUSELAGE STATION (IN)
70
60
50
40
30
20
10
225
250
275
300
Level DP
F 4.11
E 4.01
D 3.90
C 3.80
B 3.69
A 3.59
9 3.48
8 3.37
7 3.27
6 3.16
5 3.06
4 2.95
3 2.85
2 2.74
1 2.63

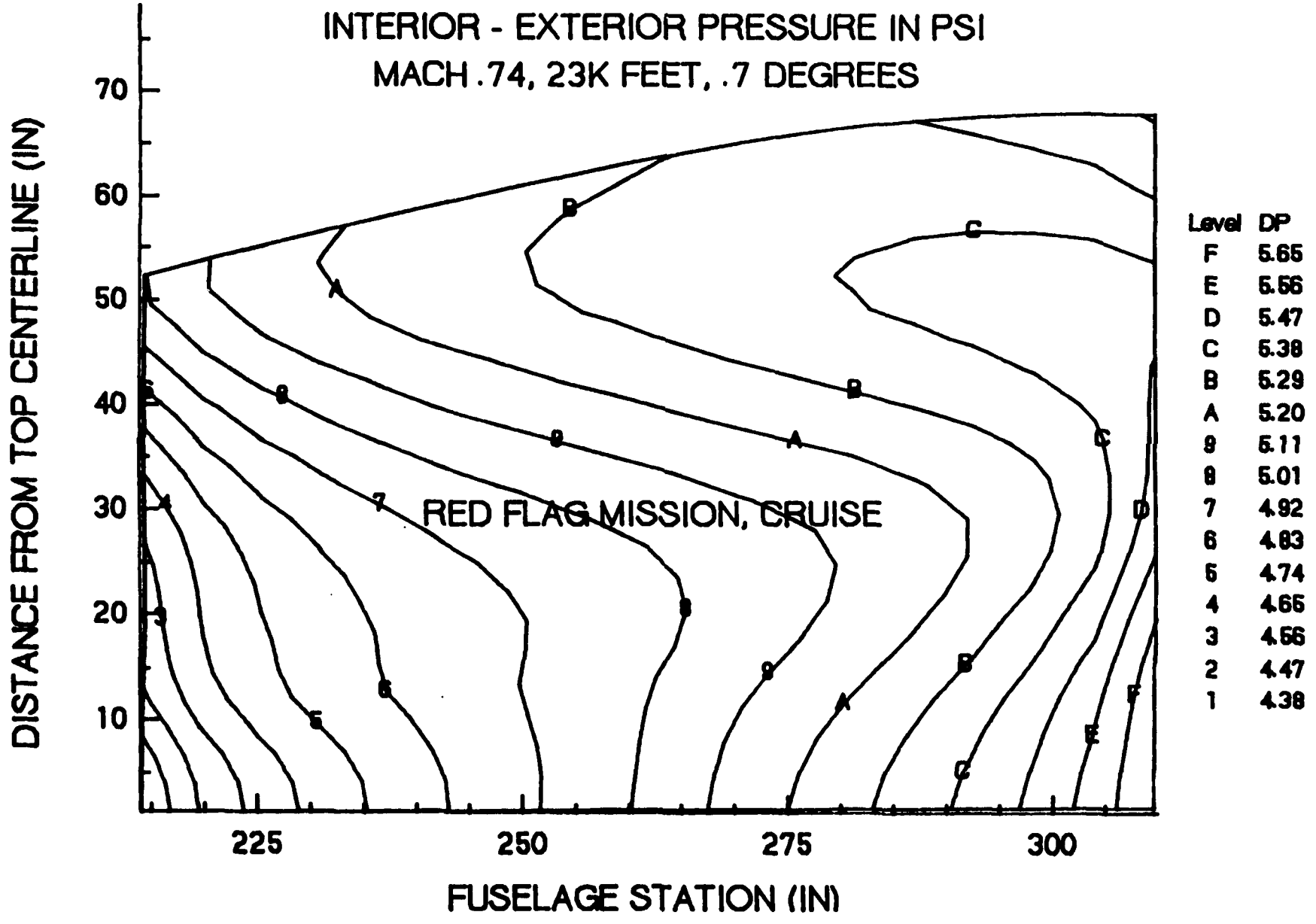

EXTERIOR TEMPERATURE IN DEGREES F
MACH .72, 17K FEET, 2 DEGREES
RED FLAG MISSION, CLIMB
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 8.88
E 7.05
D 5.21
C 3.38
B 1.55
A -0.28
9 -2.11
8 -3.94
7 -5.77
6 -7.61
5 -9.44
4 -11.2
3 -13.1
2 -14.9
1 -16.7

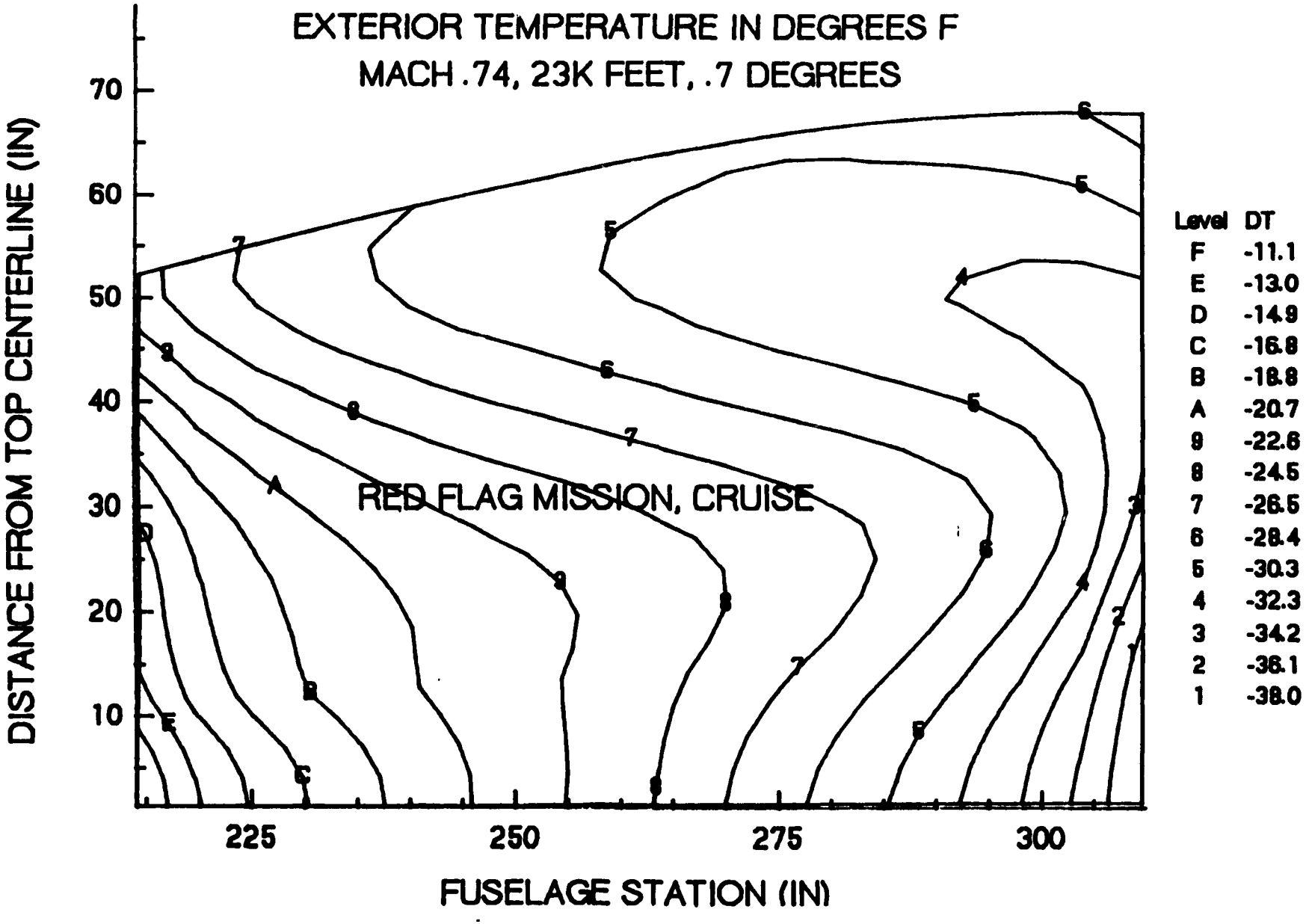

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .74 22K FEET, 1.1 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 5.43
E 5.34
D 5.24
C 5.15
B 5.05
A 4.96
9 4.87
8 4.77
7 4.68
6 4.58
5 4.49
4 4.39
3 4.30
2 4.20
1 4.11

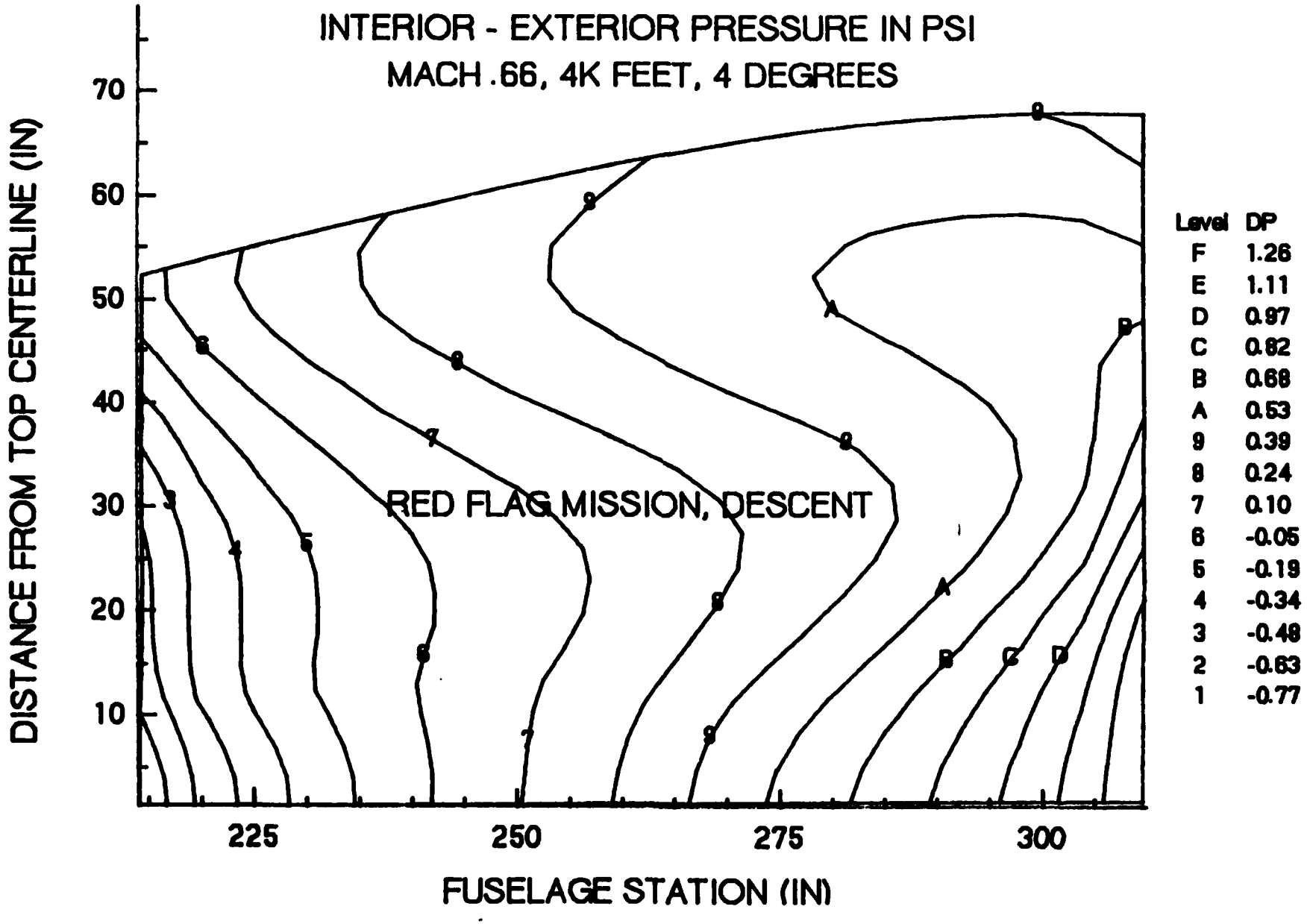

EXTERIOR TEMPERATURE IN DEGREES F
MACH .74, 22K FEET, 1.1 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
FUSELAGE STATION (IN)
70
60
50
40
30
20
10
225
250
275
300
Level DT
F -7.71
E -9.66
D -11.6
C -13.5
B -15.4
A -17.4
9 -19.3
8 -21.3
7 -23.2
6 -25.2
5 -27.1
4 -29.0
3 -31.0
2 -32.9
1 -34.9

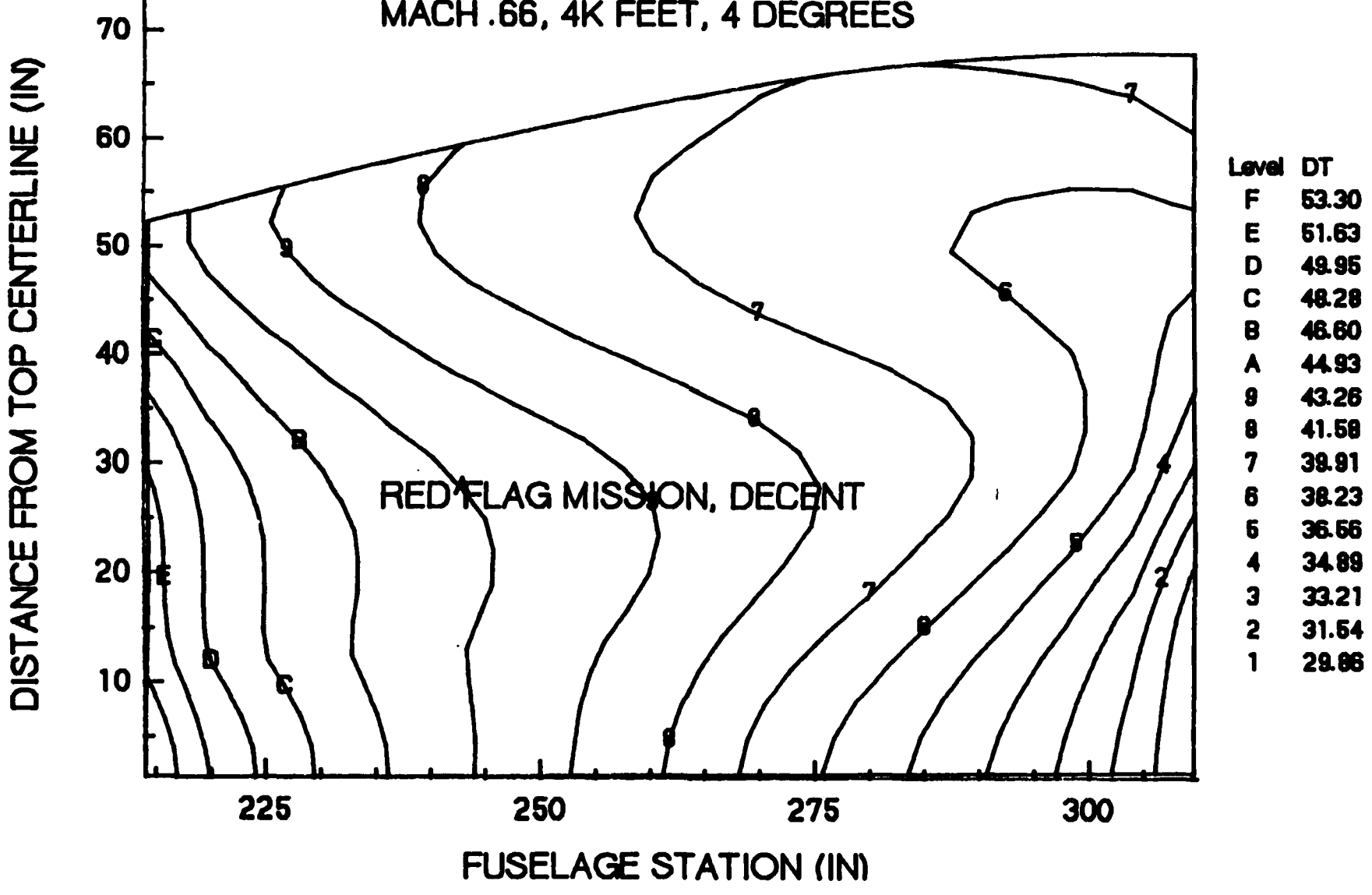

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .74, 23K FEET, .9 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 5.66
E 5.57
D 5.48
C 5.39
B 5.29
A 5.20
9 5.11
8 5.02
7 4.93
6 4.84
5 4.75
4 4.66
3 4.57
2 4.48
1 4.38

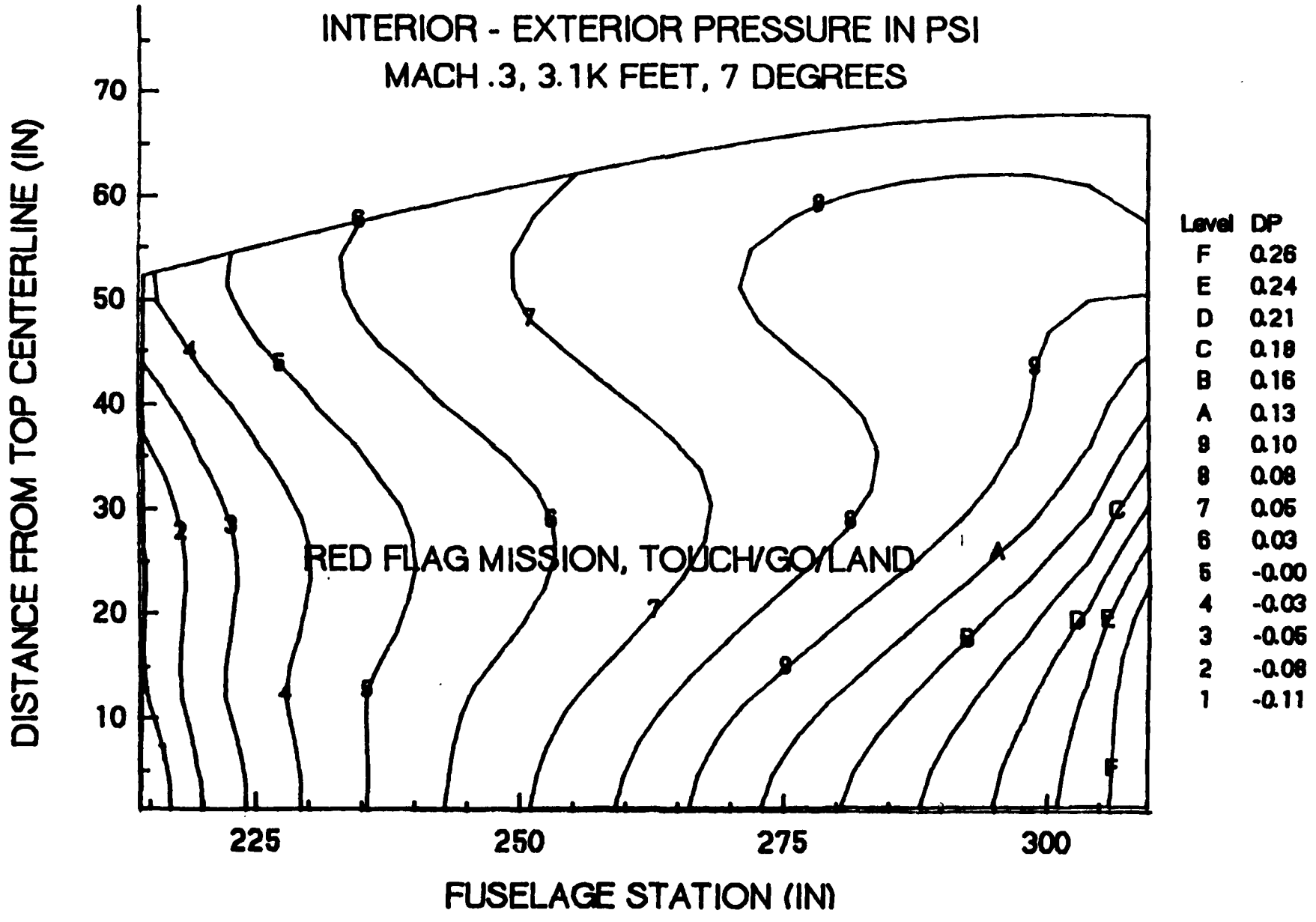

EXTERIOR TEMPERATURE IN DEGREES F
MACH .74, 23K FEET, .9 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F -11.2
E -13.1
D -15.0
C -17.0
B -18.9
A -20.8
9 -22.8
8 -24.7
7 -26.6
6 -28.5
5 -30.5
4 -32.4
3 -34.3
2 -36.2
1 -38.2

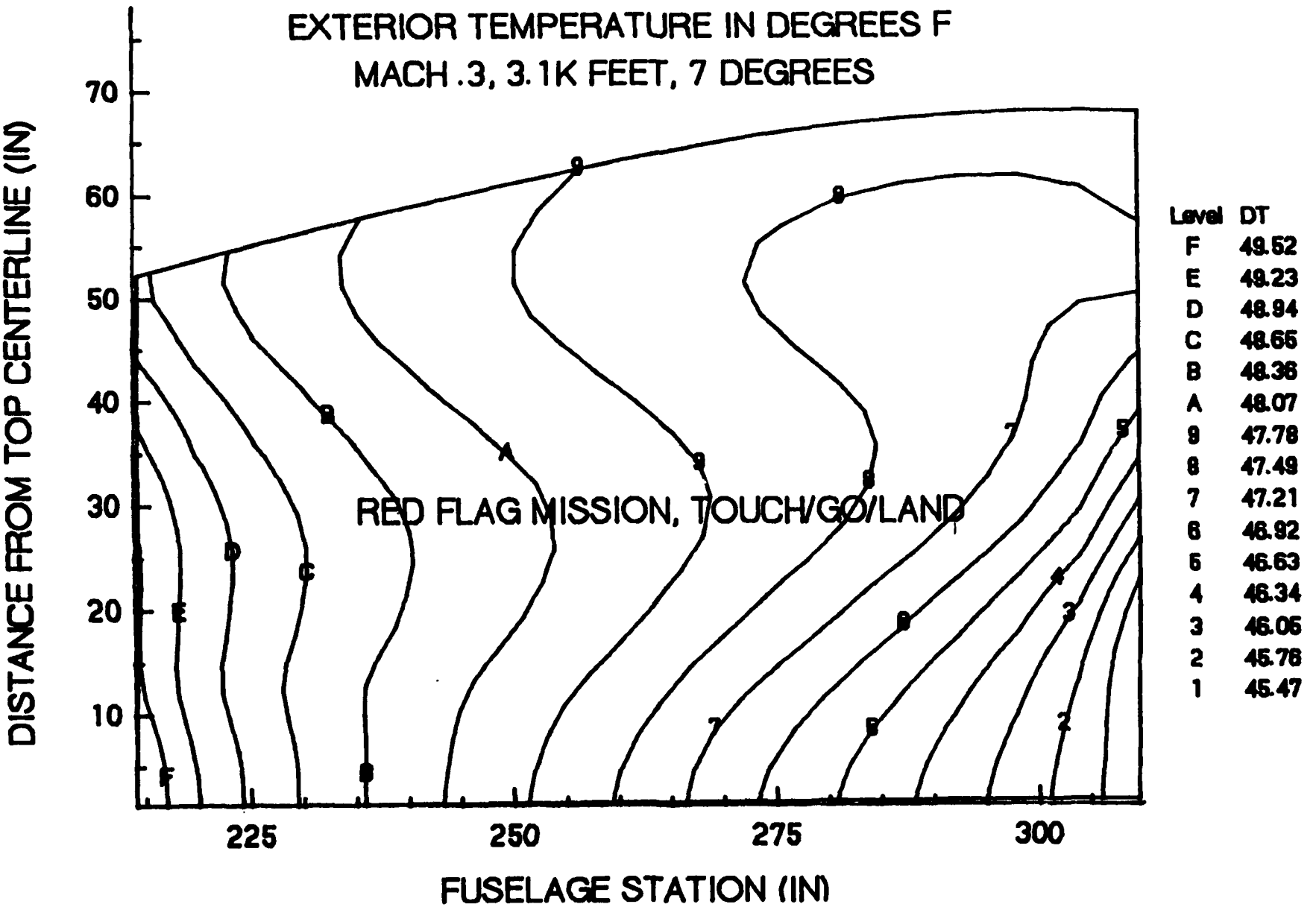

INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .74, 23K FEET, .7 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 5.65
E 5.56
D 5.47
C 5.38
B 5.29
A 5.20
9 5.11
8 5.01
7 4.92
6 4.83
5 4.74
4 4.65
3 4.56
2 4.47
1 4.38


EXTERIOR TEMPERATURE IN DEGREES F
MACH .74, 23K FEET, .7 DEGREES
RED FLAG MISSION, CRUISE
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F -11.1
E -13.0
D -14.9
C -16.8
B -18.8
A -20.7
9 -22.6
8 -24.5
7 -26.5
6 -28.4
5 -30.3
4 -32.3
3 -34.2
2 -36.1
1 -38.0


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .66, 4K FEET, 4 DEGREES
RED FLAG MISSION, DESCENT
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 1.26
E 1.11
D 0.97
C 0.82
B 0.68
A 0.53
9 0.39
8 0.24
7 0.10
6 -0.05
5 -0.19
4 -0.34
3 -0.48
2 -0.63
1 -0.77


EXTERIOR TEMPERATURE IN DEGREES F
MACH .66, 4K FEET, 4 DEGREES
RED FLAG MISSION, DECENT
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 53.30
E 51.63
D 49.95
C 48.28
B 46.60
A 44.93
9 43.26
8 41.58
7 39.91
6 38.23
5 36.56
4 34.89
3 33.21
2 31.54
1 29.86


INTERIOR - EXTERIOR PRESSURE IN PSI
MACH .3, 3.1K FEET, 7 DEGREES
RED FLAG MISSION, TOUCH/GO/LAND
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DP
F 0.26
E 0.24
D 0.21
C 0.18
B 0.16
A 0.13
9 0.10
8 0.08
7 0.05
6 0.03
5 -0.00
4 -0.03
3 -0.05
2 -0.08
1 -0.11


EXTERIOR TEMPERATURE IN DEGREES F
MACH .3, 3.1K FEET, 7 DEGREES
RED FLAG MISSION, TOUCH/GO/LAND
DISTANCE FROM TOP CENTERLINE (IN)
70
60
50
40
30
20
10
225
250
275
300
FUSELAGE STATION (IN)
Level DT
F 49.52
E 49.23
D 48.94
C 48.65
B 48.36
A 48.07
9 47.78
8 47.49
7 47.21
6 46.92
5 46.63
4 46.34
3 46.05
2 45.76
1 45.47

APPENDIX D

TRANSPARENCY GEOMETRY

CURVATURE DATA

BODY STATION	Y_o	Z_o	R_o
315.5750	-6.7476	69.4307	37.7934
312.7263	-5.8132	68.2033	38.4642
309.8799	-4.8737	66.9529	39.1532
307.0359	-3.9302	65.6796	39.8595
304.1943	-2.9848	64.3847	40.5807
301.3551	-2.0393	63.0693	41.3147
298.5182	-1.0963	61.7345	42.0590
295.6837	-.1581	60.3820	42.8105
292.8515	.7725	59.0136	43.5661
290.0218	1.6922	57.6314	44.3219
287.1944	2.5981	56.2376	45.0742
284.3693	3.4861	54.8349	45.8184
281.5467	4.3521	53.4263	46.5492
278.7264	5.1916	52.0152	47.2612
275.9085	6.0000	50.6053	47.9484
273.0930	6.7722	49.2006	48.6045
270.2798	7.5026	47.8055	49.2224
267.4690	8.1863	46.4243	49.7955
264.6605	8.8261	45.0571	50.3261
261.8540	9.4257	43.7024	50.8175
259.0495	9.9808	42.3641	51.2646
256.2470	10.4868	41.0462	51.6612
253.4463	10.9403	39.7522	52.0024
250.6477	11.3366	38.4862	52.2821
247.8509	11.6699	37.2539	52.4923
245.0561	11.9373	36.0586	52.6286
242.2633	12.1333	34.9058	52.6834
239.4724	12.2551	33.7986	52.6525
236.6834	12.2982	32.7426	52.5291
233.8964	12.2604	31.7406	52.3095
231.1113	12.1386	30.7970	51.9889
228.3282	11.9323	29.9136	51.5654
225.5470	11.6404	29.0936	51.0363
222.7678	11.2621	28.3391	50.3998
219.9906	10.8003	27.6496	49.6581
217.2152	10.2559	27.0264	48.8113
214.4418	9.6326	26.4684	47.8628
211.6704	8.9346	25.9740	46.8167
208.9009	8.1676	25.5401	45.6794
206.1333	7.3373	25.1637	44.4572

SURFACE GEOMETRY FOR B1 TRANSPARENCY

I	J	X	Y	Z	S	AREA
1	1	315.5051	-1.8261	106.9023	1.8268	11.0480
2	1	315.5094	-5.4789	106.9104	5.4631	11.0446
3	1	315.5149	-9.1128	106.5309	9.0864	11.0317
4	1	315.5228	-12.7033	105.8444	12.6927	11.0049
5	1	315.5339	-16.2566	104.9895	16.2609	10.9697
6	1	315.5468	-19.7778	104.0201	19.7658	10.9475
7	1	315.5585	-23.2370	102.8449	23.2163	10.9635
8	1	315.5673	-26.5653	101.3501	26.6333	10.9195
9	1	315.5728	-29.6912	99.4424	30.0588	11.0410
10	1	315.5750	-32.4981	97.0939	33.4895	10.8552
11	1	315.5746	-34.9250	94.3474	36.9282	10.9490
12	1	315.5726	-36.9826	91.3117	40.3659	10.7250
13	1	315.5701	-38.6573	88.0616	43.7905	10.7513
14	1	315.5676	-39.9888	84.6500	47.2211	10.6202
15	1	315.5658	-40.9952	81.1389	50.6463	10.5966
16	1	315.5650	-41.7649	77.5619	54.0855	10.5567
17	1	315.5658	-42.4093	73.9602	57.5279	10.5406
18	1	315.5677	-42.9769	70.3434	60.9560	10.5162
19	1	315.5704	-43.5075	66.7206	64.3400	10.4941
20	1	315.5735	-44.0058	63.0928	67.6531	10.4714
1	2	312.5202	-1.8131	106.4589	1.8138	10.9418
2	2	312.5329	-5.4377	106.4225	5.4270	10.9424
3	2	312.5492	-9.0387	106.0031	9.0300	10.9308
4	2	312.5724	-12.5893	105.2708	12.6194	10.8980
5	2	312.6052	-16.0912	104.3541	16.1770	10.8477
6	2	312.6432	-19.5527	103.3141	19.6827	10.8279
7	2	312.6775	-22.9531	102.0789	23.1445	10.8585
8	2	312.7036	-26.2298	100.5445	26.5786	10.8314
9	2	312.7198	-29.3151	98.6224	30.0213	10.9534
10	2	312.7263	-32.0991	96.2843	33.4676	10.7818
11	2	312.7249	-34.5237	93.5682	36.9195	10.8624
12	2	312.7191	-36.5964	90.5739	40.3689	10.6473
13	2	312.7117	-38.3028	87.3702	43.8048	10.6611
14	2	312.7043	-39.6777	84.0063	47.2454	10.5337
15	2	312.6990	-40.7368	80.5404	50.6803	10.5048
16	2	312.6967	-41.5589	77.0044	54.1287	10.4703
17	2	312.6989	-42.2442	73.4372	57.5826	10.4618
18	2	312.7047	-42.8379	69.8496	61.0264	10.4397
19	2	312.7125	-43.3791	66.2528	64.4319	10.4208
20	2	312.7218	-43.8741	62.6482	67.7746	10.4005
1	3	309.5455	-1.7999	105.9853	1.8005	10.8384
2	3	309.5661	-5.3961	105.9063	5.3901	10.8425
3	3	309.5925	-8.9645	105.4491	8.9718	10.8320
4	3	309.6302	-12.4756	104.6736	12.5425	10.7947
5	3	309.6834	-15.9272	103.6986	16.0868	10.7339
6	3	309.7451	-19.3305	102.5919	19.5894	10.7161
7	3	309.8007	-22.6735	101.2999	23.0584	10.7583

8	3	309.8430	-25.8997	99.7284	26.5059	10.7452
9	3	309.8694	-28.9451	97.7932	29.9626	10.8656
10	3	309.8799	-31.7061	95.4660	33.4217	10.7073
11	3	309.8776	-34.1274	92.7801	36.8846	10.7760
12	3	309.8683	-36.2139	89.8266	40.3444	10.5706
13	3	309.8562	-37.9502	86.6685	43.7904	10.5735
14	3	309.8443	-39.3665	83.3519	47.2400	10.4499
15	3	309.8355	-40.4758	79.9307	50.6841	10.4164
16	3	309.8318	-41.3483	76.4357	54.1409	10.3856
17	3	309.8355	-42.0731	72.9030	57.6054	10.3833
18	3	309.8448	-42.6922	69.3452	61.0634	10.3621
19	3	309.8576	-43.2442	65.7748	64.4891	10.3457
20	3	309.8726	-43.7366	62.1940	67.8594	10.3276
1	4	306.5809	-1.7866	105.4814	1.7872	10.7373
2	4	306.6089	-5.3543	105.3618	5.3525	10.7447
3	4	306.6449	-8.8900	104.8687	8.9118	10.7352
4	4	306.6961	-12.3622	104.0526	12.4623	10.6956
5	4	306.7686	-15.7647	103.0228	15.9908	10.6270
6	4	306.8525	-19.1112	101.8533	19.4868	10.6110
7	4	306.9280	-22.3983	100.5080	22.9590	10.6614
8	4	306.9857	-25.5750	98.9017	26.4158	10.6598
9	4	307.0216	-28.5809	96.9549	29.8829	10.7779
10	4	307.0359	-31.3188	94.6389	33.3523	10.6326
11	4	307.0327	-33.7362	91.9829	36.8244	10.6898
12	4	307.0201	-35.8351	89.0697	40.2927	10.4939
13	4	307.0036	-37.5994	85.9567	43.7477	10.4872
14	4	306.9875	-39.0551	82.6867	47.2054	10.3675
15	4	306.9755	-40.2123	79.3099	50.6578	10.3303
16	4	306.9705	-41.1331	75.8556	54.1224	10.3016
17	4	306.9755	-41.8959	72.3577	57.5963	10.3049
18	4	306.9882	-42.5399	68.8300	61.0672	10.2840
19	4	307.0056	-43.1028	65.2867	64.5111	10.2700
20	4	307.0260	-43.5935	61.7303	67.9071	10.2543
1	5	303.6264	-1.7731	104.9473	1.7737	10.6390
2	5	303.6614	-5.3122	104.7888	5.3142	10.6486
3	5	303.7063	-8.8154	104.2620	8.8503	10.6407
4	5	303.7701	-12.2491	103.4080	12.3789	10.5994
5	5	303.8606	-15.6035	102.3269	15.8892	10.5261
6	5	303.9653	-18.8949	101.0985	19.3753	10.5121
7	5	304.0596	-22.1275	99.7032	22.8469	10.5683
8	5	304.1315	-25.2557	98.0646	26.3092	10.5755
9	5	304.1764	-28.2228	96.1074	29.7836	10.6893
10	5	304.1943	-30.9375	93.8030	33.2605	10.5558
11	5	304.1903	-33.3501	91.1767	36.7395	10.6034
12	5	304.1745	-35.4600	88.3033	40.2146	10.4174
13	5	304.1540	-37.2506	85.2347	43.6771	10.4030
14	5	304.1338	-38.7434	82.0108	47.1418	10.2873
15	5	304.1189	-39.9463	78.6779	50.6016	10.2470
16	5	304.1126	-40.9133	75.2643	54.0730	10.2193
17	5	304.1188	-41.7128	71.8014	57.5552	10.2261
18	5	304.1347	-42.3810	68.3041	61.0375	10.2049
19	5	304.1564	-42.9549	64.7883	64.4977	10.1926

20	5	304.1819	-43.4447	61.2569	67.9174	10.1792
1	6	300.6821	-1.7596	104.3830	1.7602	10.5426
2	6	300.7235	-5.2698	104.1876	5.2753	10.5549
3	6	300.7767	-8.7406	103.6290	8.7872	10.5477
4	6	300.8524	-12.1363	102.7396	12.2926	10.5065
5	6	300.9595	-15.4438	101.6108	15.7827	10.4312
6	6	301.0836	-18.6815	100.3275	19.2557	10.4185
7	6	301.1954	-21.8610	98.8855	22.7229	10.4778
8	6	301.2806	-24.9418	97.2169	26.1872	10.4922
9	6	301.3338	-27.8706	95.2506	29.6655	10.6011
10	6	301.3551	-30.5620	92.9584	33.1468	10.4789
11	6	301.3503	-32.9691	90.3615	36.6305	10.5172
12	6	301.3316	-35.0887	87.5273	40.1106	10.3407
13	6	301.3073	-36.9036	84.5026	43.5791	10.3198
14	6	301.2833	-38.4315	81.3241	47.0496	10.2081
15	6	301.2657	-39.6777	78.0349	50.5157	10.1657
16	6	301.2582	-40.6889	74.6617	53.9930	10.1382
17	6	301.2656	-41.5237	71.2339	57.4821	10.1476
18	6	301.2843	-42.2154	67.7675	60.9740	10.1253
19	6	301.3101	-42.8005	64.2797	64.4486	10.1147
20	6	301.3403	-43.2902	60.7740	67.8894	10.1030
1	7	297.7479	-1.7459	103.7884	1.7465	10.4487
2	7	297.7953	-5.2271	103.5580	5.2357	10.4618
3	7	297.8561	-8.6655	102.9697	8.7226	10.4563
4	7	297.9427	-12.0238	102.0475	12.2037	10.4159
5	7	298.0653	-15.2855	100.8745	15.6714	10.3402
6	7	298.2073	-18.4711	99.5403	19.1286	10.3293
7	7	298.3353	-21.5988	98.0549	22.5879	10.3907
8	7	298.4330	-24.6333	96.3586	26.0505	10.4095
9	7	298.4938	-27.5243	94.3847	29.5292	10.5118
10	7	298.5182	-30.1924	92.1050	33.0123	10.4004
11	7	298.5128	-32.5931	89.5372	36.4984	10.4311
12	7	298.4913	-34.7211	86.7417	39.9815	10.2650
13	7	298.4634	-36.5586	83.7602	43.4544	10.2384
14	7	298.4360	-38.1194	80.6267	46.9291	10.1303
15	7	298.4158	-39.4067	77.3806	50.4005	10.0864
16	7	298.4072	-40.4599	74.0478	53.8824	10.0577
17	7	298.4157	-41.3285	70.6552	57.3770	10.0684
18	7	298.4372	-42.0432	67.2202	60.8767	10.0444
19	7	298.4666	-42.6396	63.7610	64.3633	10.0351
20	7	298.5013	-43.1301	60.2815	67.8229	10.0256
1	8	294.8239	-1.7321	103.1635	1.7326	10.3559
2	8	294.8768	-5.1841	102.9000	5.1955	10.3707
3	8	294.9445	-8.5903	102.2840	8.6567	10.3665
4	8	295.0411	-11.9116	101.3317	12.1122	10.3274
5	8	295.1780	-15.1286	100.1180	15.5560	10.2535
6	8	295.3365	-18.2636	98.7367	18.9945	10.2441
7	8	295.4794	-21.3410	97.2114	22.4426	10.3052
8	8	295.5885	-24.3302	95.4899	.9000	10.3272
9	8	295.6565	-27.1840	93.5096	29.3759	10.4224
10	8	295.6837	-29.8286	91.2429	32.8578	10.3208
11	8	295.6776	-32.2222	88.7040	36.3438	10.3444

12	8	295.6536	-34.3573	85.9465	39.8280	10.1879
13	8	295.6225	-36.2154	83.0076	43.3035	10.1575
14	8	295.5919	-37.8070	79.9185	46.7811	10.0535
15	8	295.5693	-39.1331	76.7152	50.2563	10.0083
16	8	295.5597	-40.2263	73.4225	53.7415	9.9781
17	8	295.5692	-41.1273	70.0654	57.2400	9.9895
18	8	295.5932	-41.8644	66.6621	60.7455	9.9630
19	8	295.6261	-42.4723	63.2320	64.2419	9.9545
20	8	295.6648	-42.9643	59.7794	67.7174	9.9466
1	9	291.9099	-1.7181	102.5084	1.7186	10.2650
2	9	291.9678	-5.1408	102.2137	5.1547	10.2807
3	9	292.0420	-8.5148	101.5720	8.5895	10.2771
4	9	292.1478	-11.7997	100.5922	12.0185	10.2404
5	9	292.2976	-14.9731	99.3414	15.4366	10.1698
6	9	292.4713	-18.0590	97.9169	18.8541	10.1620
7	9	292.6278	-21.0876	96.3550	22.2880	10.2213
8	9	292.7473	-24.0325	94.6106	25.7367	10.2452
9	9	292.8218	-26.8497	92.6253	29.2066	10.3330
10	9	292.8515	-29.4708	90.3719	32.6846	10.2402
11	9	292.8449	-31.8563	87.8617	36.1679	10.2575
12	9	292.8186	-33.9972	85.1418	39.6510	10.1113
13	9	292.7845	-35.8741	82.2449	43.1272	10.0777
14	9	292.7509	-37.4944	79.1995	46.6061	9.9772
15	9	292.7262	-38.8571	76.0387	50.0837	9.9319
16	9	292.7157	-39.9881	72.7860	53.5708	9.8987
17	9	292.7261	-40.9202	69.4645	57.0715	9.9098
18	9	292.7523	-41.6790	66.0933	60.5807	9.8809
19	9	292.7885	-42.2985	62.6928	64.0844	9.8727
20	9	292.8309	-42.7928	59.2677	67.5729	9.8661
1	10	289.0061	-1.7040	101.8230	1.7045	10.1756
2	10	289.0685	-5.0972	101.4990	5.1134	10.1916
3	10	289.1486	-8.4392	100.8336	8.5211	10.1892
4	10	289.2626	-11.6881	99.8290	11.9227	10.1549
5	10	289.4241	-14.8190	98.5446	15.3136	10.0885
6	10	289.6114	-17.8573	97.0809	18.7079	10.0825
7	10	289.7803	-20.8385	95.4856	22.1247	10.1389
8	10	289.9092	-23.7401	93.7208	25.5615	10.1633
9	10	289.9897	-26.5213	91.7318	29.0223	10.2430
10	10	290.0218	-29.1188	89.4922	32.4934	10.1589
11	10	290.0146	-31.4956	87.0104	35.9717	10.1701
12	10	289.9862	-33.6408	84.3275	39.4515	10.0344
13	10	289.9494	-35.5348	81.4719	42.9266	9.9980
14	10	289.9132	-37.1816	78.4698	46.4049	9.9015
15	10	289.8865	-38.5784	75.3511	49.8831	9.8564
16	10	289.8752	-39.7453	72.1382	53.3706	9.8203
17	10	289.8864	-40.7070	68.8525	56.8716	9.8302
18	10	289.9148	-41.4869	65.5138	60.3823	9.7979
19	10	289.9537	-42.1181	62.1434	63.8906	9.7899
20	10	289.9995	-42.6156	58.7465	67.3891	9.7849
1	11	286.1125	-1.6898	101.1074	1.6901	10.0871
2	11	286.1789	-5.0534	100.7560	5.0715	10.1034
3	11	286.2641	-8.3633	100.0690	8.4515	10.1016

4	11	286.3855	-11.5768	99.0421	11.8249	10.0700
5	11	286.5575	-14.6663	97.7276	15.1875	10.0091
6	11	286.7570	-17.6586	96.2286	18.5565	10.0048
7	11	286.9370	-20.5937	94.6034	21.9535	10.0575
8	11	287.0744	-23.4532	92.8205	25.3755	10.0813
9	11	287.1601	-26.1989	90.8291	28.8242	10.1522
10	11	287.1944	-28.7726	88.6037	32.2855	10.0759
11	11	287.1867	-31.1399	86.1501	35.7564	10.0828
12	11	287.1565	-33.2881	83.5037	39.2305	9.9570
13	11	287.1173	-35.1974	80.6888	42.7025	9.9191
14	11	287.0786	-36.8686	77.7293	46.1784	9.8262
15	11	287.0502	-38.2973	74.6523	49.6556	9.7814
16	11	287.0381	-39.4979	71.4791	53.1417	9.7414
17	11	287.0501	-40.4878	68.2294	56.6410	9.7498
18	11	287.0803	-41.2882	64.9236	60.1509	9.7138
19	11	287.1218	-41.9313	61.5838	63.6611	9.7059
20	11	287.1706	-42.4327	58.2156	67.1666	9.7019
1	12	283.2290	-1.6754	100.3616	1.6759	10.0001
2	12	283.2990	-5.0092	99.9846	5.0290	10.0159
3	12	283.3887	-8.2872	99.2780	8.3809	10.0146
4	12	283.5166	-11.4658	98.2315	11.7253	9.9863
5	12	283.6978	-14.5151	96.8904	15.0585	9.9311
6	12	283.9081	-17.4628	95.3601	18.4005	9.9281
7	12	284.0979	-20.3533	93.7083	21.7752	9.9764
8	12	284.2428	-23.1717	91.9096	25.1797	9.9989
9	12	284.3332	-25.8824	89.9172	28.6132	10.0609
10	12	284.3693	-28.4323	87.7064	32.0622	9.9922
11	12	284.3613	-30.7892	85.2808	35.5229	9.9949
12	12	284.3294	-32.9391	82.6702	38.9893	9.8784
13	12	284.2880	-34.8618	79.8955	42.4558	9.8399
14	12	284.2473	-36.5554	76.9780	45.9276	9.7513
15	12	284.2172	-38.0137	73.9424	49.4018	9.7069
16	12	284.2045	-39.2458	70.8087	52.8847	9.6628
17	12	284.2171	-40.2625	67.5952	56.3802	9.6691
18	12	284.2490	-41.0829	64.3226	59.8870	9.6296
19	12	284.2928	-41.7380	61.0140	63.3963	9.6208
20	12	284.3442	-42.2441	57.6752	66.9053	9.6175
1	13	280.3556	-1.6609	99.5855	1.6613	9.9137
2	13	280.4286	-4.9647	99.1848	4.9861	9.9290
3	13	280.5222	-8.2109	98.4607	8.3092	9.9281
4	13	280.6558	-11.3551	97.3971	11.6241	9.9025
5	13	280.8451	-14.3652	96.0331	14.9269	9.8535
6	13	281.0648	-17.2699	94.4753	18.2404	9.8520
7	13	281.2630	-20.1173	92.8002	21.5907	9.8956
8	13	281.4144	-22.8955	90.9882	24.9748	9.9160
9	13	281.5089	-25.5719	88.9961	28.3905	9.9692
10	13	281.5467	-28.0979	86.8003	31.8244	9.9072
11	13	281.5383	-30.4437	84.4024	35.2727	9.9063
12	13	281.5049	-32.5939	81.8272	38.7290	9.7997
13	13	281.4617	-34.5282	79.0920	42.1880	9.7607
14	13	281.4191	-36.2420	76.2160	45.6534	9.6758
15	13	281.3877	-37.7276	73.2213	49.1228	9.6327

16	13	281.3744	-38.9893	70.1271	52.6005	9.5843
17	13	281.3876	-40.0313	66.9498	56.0901	9.5877
18	13	281.4209	-40.8709	63.7109	59.5912	9.5441
19	13	281.4667	-41.5382	60.4341	63.0965	9.5348
20	13	281.5204	-42.0499	57.1251	66.6060	9.5321
1	14	277.4923	-1.6463	98.7791	1.6467	9.8277
2	14	277.5679	-4.9199	98.3567	4.9426	9.8424
3	14	277.6649	-8.1344	97.6171	8.2366	9.8418
4	14	277.8031	-11.2446	96.5391	11.5213	9.8188
5	14	277.9992	-14.2168	95.1556	14.7931	9.7764
6	14	278.2268	-17.0800	93.5743	18.0768	9.7766
7	14	278.4323	-19.8856	91.8793	21.4006	9.8148
8	14	278.5892	-22.6248	90.0563	24.7620	9.8326
9	14	278.6873	-25.2673	88.0658	28.1572	9.8772
10	14	278.7264	-27.7693	85.8855	31.5735	9.8216
11	14	278.7177	-30.1032	83.5151	35.0068	9.8172
12	14	278.6831	-32.2524	80.9746	38.4507	9.7201
13	14	278.6382	-34.1964	78.2783	41.9000	9.6815
14	14	278.5941	-35.9282	75.4432	45.3570	9.6003
15	14	278.5616	-37.4389	72.4891	48.8194	9.5582
16	14	278.5478	-38.7280	69.4342	52.2898	9.5055
17	14	278.5614	-39.7941	66.2933	55.7715	9.5059
18	14	278.5959	-40.6523	63.0885	59.2642	9.4581
19	14	278.6434	-41.3319	59.8438	62.7630	9.4476
20	14	278.6992	-41.8500	56.5655	66.2691	9.4451
1	15	274.6393	-1.6315	97.9425	1.6318	9.7426
2	15	274.7169	-4.8748	97.5002	4.8986	9.7560
3	15	274.8165	-8.0578	96.7472	8.1632	9.7552
4	15	274.9586	-11.1345	95.6573	11.4173	9.7350
5	15	275.1602	-14.0698	94.2579	14.6574	9.6989
6	15	275.3943	-16.8930	92.6570	17.9100	9.7003
7	15	275.6057	-19.6583	90.9455	21.2057	9.7333
8	15	275.7673	-22.3595	89.1139	24.5421	9.7480
9	15	275.8681	-24.9687	87.1264	27.9144	9.7839
10	15	275.9085	-27.4466	84.9619	31.3107	9.7343
11	15	275.8995	-29.7678	82.6187	34.7268	9.7274
12	15	275.8639	-31.9146	80.1125	38.1559	9.6391
13	15	275.8177	-33.8666	77.4545	41.5932	9.6014
14	15	275.7722	-35.6143	74.6597	45.0396	9.5238
15	15	275.7388	-37.1478	71.7457	48.4932	9.4835
16	15	275.7246	-38.4622	68.7299	51.9542	9.4263
17	15	275.7386	-39.5509	65.6256	55.4255	9.4232
18	15	275.7742	-40.4271	62.4553	58.9074	9.3708
19	15	275.8231	-41.1191	59.2434	62.3964	9.3592
20	15	275.8805	-41.6444	55.9963	65.8959	9.3571
1	16	271.7963	-1.6166	97.0757	1.6169	9.6578
2	16	271.8755	-4.8295	96.6154	4.8542	9.6699
3	16	271.9772	-7.9809	95.8510	8.0888	9.6685
4	16	272.1223	-11.0246	94.7519	11.3119	9.6507
5	16	272.3282	-13.9242	93.3400	14.5199	9.6205
6	16	272.5673	-16.7090	91.7234	17.7407	9.6236
7	16	272.7834	-19.4353	89.9987	21.0066	9.6513

8	16	272.9485	-22.0995	88.1609	24.3160	9.6632
9	16	273.0517	-24.6761	86.1777	27.6634	9.6904
10	16	273.0930	-27.1298	84.0295	31.0373	9.6460
11	16	273.0838	-29.4375	81.7133	34.4338	9.6371
12	16	273.0474	-31.5806	79.2408	37.8460	9.5575
13	16	273.0002	-33.5386	76.6204	41.2691	9.5210
14	16	272.9537	-35.3002	73.8654	44.7027	9.4467
15	16	272.9194	-36.8541	70.9912	48.1450	9.4085
16	16	272.9050	-38.1918	68.0143	51.5946	9.3465
17	16	272.9193	-39.3016	64.9469	55.0531	9.3396
18	16	272.9557	-40.1952	61.8115	58.5216	9.2834
19	16	273.0056	-40.8998	58.6328	61.9981	9.2703
20	16	273.0644	-41.4331	55.4174	65.4877	9.2680
1	17	268.9634	-1.6015	96.1786	1.6017	9.5732
2	17	269.0437	-4.7838	95.7022	4.8093	9.5840
3	17	269.1469	-7.9037	94.9284	8.0136	9.5818
4	17	269.2940	-10.9151	93.8227	11.2056	9.5659
5	17	269.5030	-13.7800	92.4019	14.3809	9.5410
6	17	269.7458	-16.5278	90.7736	17.5691	9.5454
7	17	269.9652	-19.2167	89.0390	20.8041	9.5681
8	17	270.1330	-21.8449	87.1975	24.0846	9.5771
9	17	270.2379	-24.3894	85.2198	27.4051	9.5964
10	17	270.2798	-26.8188	83.0884	30.7544	9.5568
11	17	270.2705	-29.1122	80.7989	34.1292	9.5463
12	17	270.2335	-31.2503	78.3595	37.5222	9.4749
13	17	270.1855	-33.2126	75.7761	40.9289	9.4398
14	17	270.1382	-34.9859	73.0603	44.3476	9.3691
15	17	270.1034	-36.5579	70.2256	47.7762	9.3325
16	17	270.0887	-37.9167	67.2875	51.2121	9.2664
17	17	270.1033	-39.0463	64.2570	54.6557	9.2556
18	17	270.1403	-39.9567	61.1568	58.1084	9.1949
19	17	270.1910	-40.6740	58.0120	61.5692	9.1800
20	17	270.2507	-41.2161	54.8291	65.0455	9.1775
1	18	266.1406	-1.5864	95.2515	1.5867	9.4886
2	18	266.2215	-4.7378	94.7609	4.7639	9.4976
3	18	266.3255	-7.8264	93.9797	7.9377	9.4947
4	18	266.4739	-10.8059	92.8700	11.0983	9.4801
5	18	266.6847	-13.6372	91.4438	14.2408	9.4601
6	18	266.9297	-16.3496	89.8076	17.3958	9.4662
7	18	267.1513	-19.0023	88.0665	20.5987	9.4842
8	18	267.3207	-21.5958	86.2234	23.8492	9.4896
9	18	267.4266	-24.1087	84.2528	27.1406	9.5014
10	18	267.4690	-26.5138	82.1385	30.4635	9.4664
11	18	267.4596	-28.7920	79.8754	33.8145	9.4544
12	18	267.4222	-30.9237	77.4687	37.1861	9.3907
13	18	267.3737	-32.8884	74.9217	40.5741	9.3576
14	18	267.3260	-34.6713	72.2445	43.9756	9.2902
15	18	267.2908	-36.2592	69.4488	47.3886	9.2555
16	18	267.2760	-37.6371	66.5494	50.8085	9.1851
17	18	267.2907	-38.7851	63.5560	54.2348	9.1706
18	18	267.3280	-39.7116	60.4916	57.6691	9.1055
19	18	267.3793	-40.4418	57.3810	61.1118	9.0893

20	18	267.4396	-40.9935	54.2311	64.5715	9.0858
1	19	263.3268	-1.5711	94.2974	1.5714	9.4041
2	19	263.4081	-4.6916	93.7941	4.7182	9.4112
3	19	263.5123	-7.7489	93.0071	7.8612	9.4076
4	19	263.6612	-10.6969	91.8956	10.9902	9.3939
5	19	263.8727	-13.4957	90.4670	14.0998	9.3780
6	19	264.1188	-16.1742	88.8264	17.2216	9.3853
7	19	264.3412	-18.7922	87.0818	20.3917	9.3992
8	19	264.5115	-21.3517	85.2394	23.6105	9.4021
9	19	264.6179	-23.8336	83.2769	26.8716	9.4061
10	19	264.6605	-26.2143	81.1802	30.1663	9.3752
11	19	264.6510	-28.4767	78.9434	33.4916	9.3623
12	19	264.6134	-30.6007	76.5687	36.8400	9.3062
13	19	264.5647	-32.5661	74.0576	40.2073	9.2749
14	19	264.5168	-34.3565	71.4185	43.5895	9.2108
15	19	264.4814	-35.9581	68.6615	46.9847	9.1780
16	19	264.4665	-37.3531	65.8006	50.3865	9.1035
17	19	264.4814	-38.5181	62.8445	53.7935	9.0854
18	19	264.5188	-39.4602	59.8161	57.2073	9.0160
19	19	264.5703	-40.2034	56.7403	60.6293	8.9978
20	19	264.6309	-40.7654	53.6240	64.0696	8.9937
1	20	260.5212	-1.5557	93.3192	1.5560	9.3193
2	20	260.6023	-4.6451	92.8045	4.6721	9.3248
3	20	260.7065	-7.6713	92.0133	7.7843	9.3200
4	20	260.8552	-10.5882	90.9019	10.8815	9.3070
5	20	261.0665	-13.3554	89.4736	13.9583	9.2952
6	20	261.3124	-16.0012	87.8316	17.0465	9.3039
7	20	261.5347	-18.5857	86.0861	20.1833	9.3131
8	20	261.7050	-21.1124	84.2464	23.3697	9.3134
9	20	261.8115	-23.5637	82.2932	26.5990	9.3107
10	20	261.8540	-25.9198	80.2142	29.8640	9.2838
11	20	261.8445	-28.1657	78.0035	33.1620	9.2704
12	20	261.8069	-30.2809	75.6604	36.4856	9.2209
13	20	261.7582	-32.2454	73.1846	39.8303	9.1917
14	20	261.7103	-34.0415	70.5832	43.1913	9.1305
15	20	261.6750	-35.6549	67.8646	46.5668	9.1001
16	20	261.6600	-37.0652	65.0421	49.9488	9.0220
17	20	261.6748	-38.2460	62.1234	53.3345	9.0001
18	20	261.7123	-39.2031	59.1313	56.7260	8.9269
19	20	261.7639	-39.9593	56.0907	60.1252	8.9065
20	20	261.8244	-40.5324	53.0085	63.5436	8.9013
1	21	257.7234	-1.5402	92.3173	1.5404	9.2342
2	21	257.8041	-4.5985	91.7928	4.6258	9.2379
3	21	257.9077	-7.5935	90.9988	7.7068	9.2316
4	21	258.0556	-10.4796	89.8895	10.7721	9.2194
5	21	258.2658	-13.2162	88.4641	13.8162	9.2106
6	21	258.5103	-15.8306	86.8238	16.8708	9.2207
7	21	258.7317	-18.3828	85.0799	19.9739	9.2264
8	21	258.9011	-20.8774	83.2447	23.1269	9.2240
9	21	259.0071	-23.2987	81.3019	26.3234	9.2150
10	21	259.0495	-25.6302	79.2411	29.5574	9.1910
11	21	259.0401	-27.8589	77.0562	32.8266	9.1766

12	21	259.0026	-29.9642	74.7443	36.1236	9.1340
13	21	258.9541	-31.9262	72.3034	39.4439	9.1073
14	21	258.9064	-33.7264	69.7391	42.7822	9.0495
15	21	258.8712	-35.3495	67.0586	46.1360	9.0207
16	21	258.8564	-36.7734	64.2744	49.4963	8.9392
17	21	258.8711	-37.9689	61.3932	52.8591	8.9137
18	21	258.9084	-38.9406	58.4378	56.2263	8.8366
19	21	258.9597	-39.7100	55.4328	59.6008	8.8140
20	21	259.0201	-40.2948	52.3852	62.9949	8.8078
1	22	254.9337	-1.5245	91.2917	1.5247	9.1488
2	22	255.0134	-4.5515	90.7587	4.5790	9.1506
3	22	255.1160	-7.5155	89.9636	7.6288	9.1431
4	22	255.2624	-10.3714	88.8584	10.6624	9.1310
5	22	255.4705	-13.0781	87.4385	13.6737	9.1248
6	22	255.7128	-15.6623	85.8028	16.6948	9.1358
7	22	255.9320	-18.1834	84.0633	19.7638	9.1382
8	22	256.0999	-20.6468	82.2345	22.8827	9.1331
9	22	256.2049	-23.0386	80.3030	26.0455	9.1186
10	22	256.2470	-25.3455	78.2608	29.2472	9.0976
11	22	256.2376	-27.5562	76.1015	32.4861	9.0830
12	22	256.2005	-29.6504	73.8204	35.7548	9.0463
13	22	256.1524	-31.6086	71.4138	39.0494	9.0219
14	22	256.1051	-33.4110	68.8862	42.3629	8.9666
15	22	256.0703	-35.0422	66.2435	45.6933	8.9402
16	22	256.0556	-36.4780	63.4975	49.0302	8.8560
17	22	256.0702	-37.6870	60.6540	52.3683	8.8267
18	22	256.1071	-38.6726	57.7355	55.7096	8.7466
19	22	256.1580	-39.4553	54.7666	59.0573	8.7217
20	22	256.2177	-40.0525	51.7541	62.4250	8.7137
1	23	252.1518	-1.5088	90.2425	1.5089	9.0628
2	23	252.2303	-4.5043	89.7025	4.5319	9.0628
3	23	252.3314	-7.4373	88.9077	7.5503	9.0538
4	23	252.4757	-10.2633	87.8085	10.5521	9.0411
5	23	252.6808	-12.9412	86.3969	13.5309	9.0368
6	23	252.9196	-15.4964	84.7689	16.5186	9.0491
7	23	253.1357	-17.9875	83.0362	19.5533	9.0487
8	23	253.3013	-20.4206	81.2157	22.6376	9.0412
9	23	253.4049	-22.7834	79.2967	25.7659	9.0218
10	23	253.4463	-25.0655	77.2733	28.9341	9.0031
11	23	253.4371	-27.2577	75.1395	32.1415	8.9885
12	23	253.4005	-29.3398	72.8886	35.3807	8.9575
13	23	253.3531	-31.2926	70.5159	38.6475	8.9351
14	23	253.3065	-33.0955	68.0246	41.9347	8.8828
15	23	253.2721	-34.7328	65.4194	45.2399	8.8585
16	23	253.2576	-36.1788	62.7113	48.5516	8.7719
17	23	253.2720	-37.4002	59.9058	51.8633	8.7387
18	23	253.3084	-38.3993	57.0246	55.1770	8.6555
19	23	253.3585	-39.1954	54.0920	58.4965	8.6287
20	23	253.4175	-39.8055	51.1151	61.8357	8.6193
1	24	249.3778	-1.4930	89.1697	1.4932	8.9764
2	24	249.4549	-4.4569	88.6240	4.4846	8.9743
3	24	249.5539	-7.3590	87.8311	7.4714	8.9640

4	24	249.6954	-10.1556	86.7398	10.4416	8.9505
5	24	249.8966	-12.8054	85.3392	13.3880	8.9475
6	24	250.1308	-15.3328	83.7218	16.3424	8.9607
7	24	250.3428	-17.7952	81.9987	19.3429	8.9581
8	24	250.5053	-20.1988	80.1883	22.3921	8.9485
9	24	250.6070	-22.5330	78.2828	25.4850	8.9242
10	24	250.6477	-24.7903	76.2786	28.6189	8.9078
11	24	250.6386	-26.9634	74.1700	31.7936	8.8928
12	24	250.6026	-29.0322	71.9491	35.0016	8.8672
13	24	250.5561	-30.9781	69.6097	38.2393	8.8469
14	24	250.5104	-32.7798	67.1542	41.4984	8.7974
15	24	250.4766	-34.4213	64.5862	44.7766	8.7751
16	24	250.4624	-35.8759	61.9160	48.0615	8.6862
17	24	250.4765	-37.1085	59.1484	51.3453	8.6506
18	24	250.5123	-38.1205	56.3048	54.6299	8.5642
19	24	250.5615	-38.9301	53.4092	57.9193	8.5351
20	24	250.6194	-39.5540	50.4682	61.2285	8.5239
1	25	246.6118	-1.4771	88.0732	1.4773	8.8895
2	25	246.6869	-4.4093	87.5233	4.4370	8.8854
3	25	246.7835	-7.2805	86.7337	7.3921	8.8736
4	25	246.9215	-10.0480	85.6523	10.3306	8.8589
5	25	247.1178	-12.6707	84.2654	13.2451	8.8561
6	25	247.3464	-15.1716	82.6617	16.1666	8.8698
7	25	247.5533	-17.6063	80.9507	19.1327	8.8653
8	25	247.7120	-19.9814	79.1523	22.1467	8.8543
9	25	247.8112	-22.2875	77.2614	25.2036	8.8260
10	25	247.8509	-24.5200	75.2767	28.3023	8.8119
11	25	247.8420	-26.6733	73.1932	31.4432	8.7966
12	25	247.8070	-28.7277	71.0016	34.6188	8.7755
13	25	247.7616	-30.6651	68.6952	37.8256	8.7574
14	25	247.7169	-32.4639	66.2750	41.0551	8.7105
15	25	247.6839	-34.1078	63.7439	44.3047	8.6902
16	25	247.6700	-35.5692	61.1116	47.5609	8.5997
17	25	247.6838	-36.8119	58.3820	50.8154	8.5610
18	25	247.7188	-37.8363	55.5763	54.0695	8.4722
19	25	247.7668	-38.6596	52.7179	57.3276	8.4411
20	25	247.8233	-39.2977	49.8135	60.6048	8.4286
1	26	243.8536	-1.4611	86.9531	1.4612	8.8018
2	26	243.9265	-4.3615	86.4004	4.3891	8.7960
3	26	244.0202	-7.2019	85.6157	7.3125	8.7824
4	26	244.1541	-9.9407	84.5461	10.2194	8.7661
5	26	244.3446	-12.5372	83.1755	13.1022	8.7630
6	26	244.5664	-15.0128	81.5885	15.9912	8.7770
7	26	244.7673	-17.4210	79.8923	18.9231	8.7713
8	26	244.9212	-19.7684	78.1078	21.9015	8.7590
9	26	245.0176	-22.0469	76.2324	24.9222	8.7274
10	26	245.0561	-24.2544	74.2676	27.9848	8.7146
11	26	245.0475	-26.3873	72.2089	31.0909	8.6995
12	26	245.0135	-28.4263	70.0464	34.2329	8.6822
13	26	244.9694	-30.3538	67.7723	37.4075	8.6663
14	26	244.9259	-32.1479	65.3870	40.6058	8.6219
15	26	244.8940	-33.7923	62.8925	43.8250	8.6031

16	26	244.8805	-35.2587	60.2979	47.0509	8.5118
17	26	244.8939	-36.5104	57.6065	50.2746	8.4711
18	26	244.9278	-37.5468	54.8391	53.4969	8.3803
19	26	244.9745	-38.3838	52.0183	56.7224	8.3467
20	26	245.0293	-39.0368	49.1509	59.9663	8.3324
1	27	241.1034	-1.4449	85.8093	1.4451	8.7133
2	27	241.1737	-4.3133	85.2552	4.3408	8.7055
3	27	241.2641	-7.1231	84.4769	7.2324	8.6905
4	27	241.3932	-9.8336	83.4212	10.1078	8.6726
5	27	241.5769	-12.4048	82.0695	12.9595	8.6681
6	27	241.7908	-14.8563	80.5022	15.8163	8.6826
7	27	241.9846	-17.2393	78.8234	18.7144	8.6761
8	27	242.1331	-19.5599	77.0546	21.6573	8.6625
9	27	242.2261	-21.8111	75.1960	24.6410	8.6277
10	27	242.2633	-23.9937	73.2513	27.6672	8.6164
11	27	242.2550	-26.1054	71.2173	30.7373	8.6020
12	27	242.2221	-28.1278	69.0833	33.8446	8.5879
13	27	242.1796	-30.0439	66.8411	36.9856	8.5736
14	27	242.1377	-31.8316	64.4903	40.1511	8.5312
15	27	242.1069	-33.4747	62.0321	43.3382	8.5147
16	27	242.0938	-34.9445	59.4750	46.5325	8.4227
17	27	242.1068	-36.2040	56.8220	49.7239	8.3795
18	27	242.1395	-37.2518	54.0931	52.9132	8.2875
19	27	242.1845	-38.1026	51.3104	56.1049	8.2521
20	27	242.2374	-38.7712	48.4805	59.3143	8.2360
1	28	238.3611	-1.4287	84.6419	1.4290	8.6241
2	28	238.4285	-4.2650	84.0878	4.2922	8.6149
3	28	238.5150	-7.0441	83.3174	7.1521	8.5978
4	28	238.6387	-9.7267	82.2775	9.9961	8.5779
5	28	238.8146	-12.2735	80.9475	12.8169	8.5716
6	28	239.0196	-14.7022	79.4029	15.6422	8.5859
7	28	239.2053	-17.0610	77.7440	18.5066	8.5785
8	28	239.3476	-19.3557	75.9929	21.4139	8.5646
9	28	239.4367	-21.5803	74.1520	24.3608	8.5278
10	28	239.4724	-23.7377	72.2278	27.3497	8.5172
11	28	239.4644	-25.8277	70.2183	30.3831	8.5029
12	28	239.4329	-27.8325	68.1123	33.4546	8.4918
13	28	239.3922	-29.7356	65.9015	36.5606	8.4794
14	28	239.3520	-31.5152	63.5848	39.6918	8.4392
15	28	239.3225	-33.1550	61.1626	42.8453	8.4239
16	28	239.3100	-34.6266	58.6430	46.0063	8.3325
17	28	239.3224	-35.8927	56.0284	49.1642	8.2877
18	28	239.3538	-36.9514	53.3383	52.3195	8.1947
19	28	239.3969	-37.8161	50.5942	55.4763	8.1574
20	28	239.4476	-38.5010	47.8022	58.6502	8.1396
1	29	235.6268	-1.4123	83.4508	1.4126	8.5341
2	29	235.6907	-4.2165	82.8982	4.2435	8.5235
3	29	235.7730	-6.9650	82.1372	7.0713	8.5048
4	29	235.8906	-9.6201	81.1150	9.8842	8.4825
5	29	236.0579	-12.1433	79.8093	12.6746	8.4736
6	29	236.2528	-14.5505	78.2906	15.4689	8.4877
7	29	236.4294	-16.8863	76.6542	18.3000	8.4800

8	29	236.5648	-19.1559	74.9226	21.1718	8.4657
9	29	236.6495	-21.3543	73.1004	24.0816	8.4274
10	29	236.6834	-23.4866	71.1971	27.0329	8.4172
11	29	236.6758	-25.5542	69.2119	30.0289	8.4030
12	29	236.6459	-27.5401	67.1336	33.0633	8.3943
13	29	236.6071	-29.4289	64.9537	36.1331	8.3832
14	29	236.5689	-31.1985	62.6705	39.2286	8.3450
15	29	236.5408	-32.8334	60.2840	42.3470	8.3311
16	29	236.5290	-34.3049	57.8017	45.4732	8.2405
17	29	236.5407	-35.5765	55.2257	48.5964	8.1944
18	29	236.5705	-36.6456	52.5748	51.7165	8.1011
19	29	236.6116	-37.5243	49.8696	54.8377	8.0623
20	29	236.6599	-38.2261	47.1161	57.9750	8.0428
1	30	232.9003	-1.3958	82.2361	1.3960	8.4432
2	30	232.9606	-4.1677	81.6863	4.1945	8.4308
3	30	233.0382	-6.8857	80.9363	6.9903	8.4110
4	30	233.1490	-9.5138	79.9338	9.7722	8.3862
5	30	233.3067	-12.0143	78.6552	12.5326	8.3742
6	30	233.4904	-14.4011	77.1651	15.2965	8.3876
7	30	233.6568	-16.7152	75.5539	18.0948	8.3795
8	30	233.7845	-18.9606	73.8437	20.9312	8.3654
9	30	233.8644	-21.1332	72.0414	23.8037	8.3260
10	30	233.8964	-23.2403	70.1592	26.7170	8.3163
11	30	233.8893	-25.2848	68.1981	29.6748	8.3025
12	30	233.8611	-27.2509	66.1470	32.6714	8.2953
13	30	233.8245	-29.1238	63.9975	35.7038	8.2856
14	30	233.7885	-30.8818	61.7473	38.7623	8.2489
15	30	233.7619	-32.5096	59.3963	41.8438	8.2362
16	30	233.7508	-33.9795	56.9512	44.9338	8.1472
17	30	233.7619	-35.2553	54.4140	48.0209	8.1001
18	30	233.7900	-36.3344	51.8026	51.1050	8.0071
19	30	233.8286	-37.2272	49.1367	54.1898	7.9673
20	30	233.8742	-37.9466	46.4221	57.2898	7.9461
1	31	230.1818	-1.3793	80.9977	1.3795	8.3512
2	31	230.2381	-4.1186	80.4522	4.1450	8.3379
3	31	230.3104	-6.8063	79.7147	6.9089	8.3168
4	31	230.4138	-9.4076	78.7339	9.6600	8.2890
5	31	230.5609	-11.8864	77.4849	12.3910	8.2738
6	31	230.7324	-14.2541	76.0266	15.1250	8.2860
7	31	230.8877	-16.5475	74.4432	17.8908	8.2777
8	31	231.0069	-18.7696	72.7562	20.6920	8.2637
9	31	231.0815	-20.9170	70.9748	23.5274	8.2240
10	31	231.1113	-22.9988	69.1142	26.4023	8.2142
11	31	231.1047	-25.0196	67.1769	29.3213	8.2008
12	31	231.0783	-26.9646	65.1525	32.2791	8.1950
13	31	231.0442	-28.8202	63.0330	35.2728	8.1859
14	31	231.0106	-30.5648	60.8155	38.2928	8.1508
15	31	230.9858	-32.1838	58.4995	41.3363	8.1390
16	31	230.9754	-33.6502	56.0915	44.3885	8.0521
17	31	230.9857	-34.9294	53.5933	47.4384	8.0050
18	31	231.0120	-36.0177	51.0216	50.4856	7.9129
19	31	231.0481	-36.9249	48.3954	53.5333	7.8721

20	31	231.0906	-37.6624	45.7203	56.5951	7.8492
1	32	227.4712	-1.3626	79.7357	1.3629	8.2585
2	32	227.5231	-4.0693	79.1959	4.0953	8.2443
3	32	227.5898	-6.7267	78.4724	6.8272	8.2218
4	32	227.6851	-9.3017	77.5152	9.5477	8.1915
5	32	227.8207	-11.7596	76.2985	12.2496	8.1724
6	32	227.9788	-14.1095	74.8751	14.9544	8.1829
7	32	228.1220	-16.3834	73.3220	17.6883	8.1745
8	32	228.2319	-18.5830	71.6602	20.4544	8.1607
9	32	228.3007	-20.7056	69.9007	23.2526	8.1213
10	32	228.3282	-22.7621	68.0619	26.0889	8.1116
11	32	228.3221	-24.7585	66.1482	28.9686	8.0983
12	32	228.2978	-26.6814	64.1503	31.8865	8.0927
13	32	228.2663	-28.5181	62.0602	34.8404	8.0843
14	32	228.2353	-30.2476	59.8749	37.8206	8.0504
15	32	228.2125	-31.8560	57.5937	40.8245	8.0394
16	32	228.2029	-33.3173	55.2227	43.8376	7.9555
17	32	228.2124	-34.5985	52.7634	46.8493	7.9087
18	32	228.2366	-35.6957	50.2318	49.8586	7.8183
19	32	228.2699	-36.6171	47.6458	52.8683	7.7769
20	32	228.3091	-37.3736	45.0106	55.8914	7.7530
1	33	224.7686	-1.3458	78.4501	1.3459	8.1647
2	33	224.8156	-4.0198	77.9174	4.0454	8.1498
3	33	224.8762	-6.6469	77.2093	6.7452	8.1265
4	33	224.9628	-9.1960	76.2777	9.4352	8.0939
5	33	225.0860	-11.6340	75.0961	12.1086	8.0707
6	33	225.2295	-13.9672	73.7104	14.7847	8.0790
7	33	225.3597	-16.2228	72.1904	17.4870	8.0703
8	33	225.4595	-18.4008	70.5555	20.2185	8.0567
9	33	225.5220	-20.4991	68.8191	22.9794	8.0183
10	33	225.5470	-22.5302	67.0024	25.7769	8.0081
11	33	225.5414	-24.5016	65.1122	28.6166	7.9949
12	33	225.5194	-26.4014	63.1401	31.4941	7.9887
13	33	225.4908	-28.2176	61.0790	34.4069	7.9809
14	33	225.4626	-29.9303	58.9254	37.3461	7.9482
15	33	225.4419	-31.5261	56.6788	40.3087	7.9375
16	33	225.4331	-32.9807	54.3447	43.2814	7.8571
17	33	225.4418	-34.2627	51.9245	46.2536	7.8112
18	33	225.4638	-35.3683	49.4333	49.2242	7.7237
19	33	225.4940	-36.3042	46.8878	52.1952	7.6817
20	33	225.5297	-37.0801	44.2930	55.1789	7.6568
1	34	222.0738	-1.3289	77.1408	1.3291	8.0699
2	34	222.1158	-3.9701	76.6166	3.9953	8.0548
3	34	222.1697	-6.5669	75.9255	6.6629	8.0306
4	34	222.2469	-9.0906	75.0215	9.3226	7.9958
5	34	222.3567	-11.5094	73.8776	11.9678	7.9686
6	34	222.4847	-13.8272	72.5327	14.6158	7.9741
7	34	222.6008	-16.0657	71.0483	17.2870	7.9649
8	34	222.6898	-18.2231	69.4423	19.9841	7.9512
9	34	222.7455	-20.2976	67.7299	22.7079	7.9143
10	34	222.7678	-22.3032	65.9358	25.4662	7.9030
11	34	222.7628	-24.2488	64.0688	28.2653	7.8903

12	34	222.7431	-26.1243	62.1222	31.1014	7.8833
13	34	222.7176	-27.9186	60.0895	33.9722	7.8756
14	34	222.6925	-29.6127	57.9672	36.8689	7.8436
15	34	222.6740	-31.1942	55.7548	39.7890	7.8329
16	34	222.6662	-32.6402	53.4574	42.7197	7.7569
17	34	222.6740	-33.9220	51.0765	45.6512	7.7127
18	34	222.6936	-35.0354	48.6261	48.5820	7.6286
19	34	222.7206	-35.9859	46.1215	51.5137	7.5869
20	34	222.7523	-36.7820	43.5676	54.4572	7.5612
1	35	219.3870	-1.3119	75.8079	1.3122	7.9743
2	35	219.4235	-3.9201	75.2936	3.9448	7.9587
3	35	219.4704	-6.4868	74.6211	6.5803	7.9343
4	35	219.5375	-8.9854	73.7465	9.2098	7.8981
5	35	219.6330	-11.3861	72.6430	11.8274	7.8668
6	35	219.7443	-13.6897	71.3420	14.4478	7.8691
7	35	219.8452	-15.9122	69.8957	17.0882	7.8585
8	35	219.9227	-18.0497	68.3205	19.7509	7.8448
9	35	219.9712	-20.1008	66.6332	22.4375	7.8100
10	35	219.9906	-22.0809	64.8619	25.1566	7.7973
11	35	219.9862	-24.0002	63.0180	27.9145	7.7849
12	35	219.9691	-25.8503	61.0964	30.7085	7.7763
13	35	219.9469	-27.6212	59.0916	33.5360	7.7682
14	35	219.9250	-29.2950	57.0002	36.3890	7.7365
15	35	219.9089	-30.8601	54.8217	39.2649	7.7257
16	35	219.9021	-32.2960	52.5610	42.1522	7.6549
17	35	219.9089	-33.5764	50.2195	45.0418	7.6129
18	35	219.9260	-34.6971	47.8101	47.9318	7.5334
19	35	219.9494	-35.6623	45.3469	50.8233	7.4924
20	35	219.9771	-36.4792	42.8344	53.7257	7.4664
1	36	216.7081	-1.2949	74.4513	1.2950	7.8778
2	36	216.7387	-3.8700	73.9483	3.8941	7.8624
3	36	216.7781	-6.4066	73.2959	6.4974	7.8379
4	36	216.8345	-8.8804	72.4528	9.0968	7.8006
5	36	216.9147	-11.2638	71.3923	11.6871	7.7663
6	36	217.0082	-13.5545	70.1382	14.2803	7.7639
7	36	217.0931	-15.7622	68.7327	16.8903	7.7517
8	36	217.1581	-17.8808	67.1901	19.5188	7.7374
9	36	217.1989	-19.9090	65.5290	22.1683	7.7049
10	36	217.2152	-21.8634	63.7809	24.8477	7.6907
11	36	217.2116	-23.7558	61.9599	27.5640	7.6788
12	36	217.1972	-25.5793	60.0628	30.3148	7.6677
13	36	217.1785	-27.3253	58.0855	33.0980	7.6591
14	36	217.1602	-28.9772	56.0244	35.9061	7.6274
15	36	217.1466	-30.5241	53.8796	38.7362	7.6162
16	36	217.1409	-31.9481	51.6553	41.5787	7.5509
17	36	217.1466	-33.2259	49.3534	44.4249	7.5116
18	36	217.1609	-34.3534	46.9854	47.2731	7.4376
19	36	217.1807	-35.3334	44.5639	50.1233	7.3983
20	36	217.2039	-36.1718	42.0933	52.9836	7.3725
1	37	214.0371	-1.2777	73.0711	1.2778	7.7798
2	37	214.0615	-3.8195	72.5808	3.8431	7.7651
3	37	214.0930	-6.3261	71.9499	6.4140	7.7410

4	37	214.1380	-8.7757	71.1403	8.9836	7.7038
5	37	214.2020	-11.1426	70.1256	11.5468	7.6667
6	37	214.2766	-13.4216	68.9213	14.1131	7.6593
7	37	214.3443	-15.6158	67.5592	16.6931	7.6442
8	37	214.3962	-17.7162	66.0511	19.2874	7.6288
9	37	214.4288	-19.7220	64.4173	21.8996	7.5991
10	37	214.4418	-21.6508	62.6926	24.5392	7.5832
11	37	214.4389	-23.5155	60.8943	27.2132	7.5715
12	37	214.4274	-25.3114	59.0214	29.9201	7.5574
13	37	214.4125	-27.0310	57.0710	32.6577	7.5477
14	37	214.3979	-28.6591	55.0399	35.4194	7.5159
15	37	214.3871	-30.1861	52.9283	38.2025	7.5038
16	37	214.3825	-31.5964	50.7405	40.9983	7.4449
17	37	214.3871	-32.8705	48.4782	43.7999	7.4097
18	37	214.3985	-34.0044	46.1519	46.6049	7.3419
19	37	214.4142	-34.9992	43.7726	49.4126	7.3046
20	37	214.4328	-35.8597	41.3443	52.2297	7.2797
1	38	211.3740	-1.2604	71.6672	1.2607	7.6812
2	38	211.3919	-3.7689	71.1911	3.7919	7.6678
3	38	211.4149	-6.2456	70.5833	6.3305	7.6448
4	38	211.4479	-8.6712	69.8091	8.8701	7.6081
5	38	211.4948	-11.0226	68.8428	11.4065	7.5693
6	38	211.5494	-13.2911	67.6913	13.9463	7.5559
7	38	211.5990	-15.4728	66.3753	16.4960	7.5364
8	38	211.6370	-17.5560	64.9035	19.0562	7.5196
9	38	211.6608	-19.5399	63.2980	21.6312	7.4924
10	38	211.6704	-21.4429	61.5972	24.2304	7.4744
11	38	211.6683	-23.2794	59.8214	26.8616	7.4635
12	38	211.6598	-25.0466	57.9721	29.5237	7.4458
13	38	211.6489	-26.7383	56.0483	32.2144	7.4345
14	38	211.6382	-28.3409	54.0466	34.9283	7.4025
15	38	211.6303	-29.8459	51.9680	37.6625	7.3890
16	38	211.6269	-31.2409	49.8165	40.4101	7.3370
17	38	211.6302	-32.5103	47.5940	43.1656	7.3061
18	38	211.6386	-33.6499	45.3096	45.9260	7.2461
19	38	211.6502	-34.6597	42.9729	48.6899	7.2114
20	38	211.6638	-35.5429	40.5875	51.4622	7.1881
1	39	208.7188	-1.2429	70.2397	1.2432	7.5815
2	39	208.7298	-3.7180	69.7792	3.7403	7.5696
3	39	208.7440	-6.1649	69.1960	6.2465	7.5481
4	39	208.7642	-8.5669	68.4592	8.7563	7.5135
5	39	208.7930	-10.9038	67.5439	11.2661	7.4747
6	39	208.8266	-13.1630	66.4483	13.7794	7.4547
7	39	208.8570	-15.3334	65.1809	16.2990	7.4290
8	39	208.8804	-17.4002	63.7474	18.8248	7.4099
9	39	208.8950	-19.3627	62.1712	21.3622	7.3857
10	39	208.9009	-21.2399	60.4945	23.9208	7.3649
11	39	208.8996	-23.0474	58.7410	26.5083	7.3545
12	39	208.8944	-24.7848	56.9150	29.1246	7.3320
13	39	208.8877	-26.4471	55.0172	31.7673	7.3192
14	39	208.8811	-28.0224	53.0445	34.4319	7.2865
15	39	208.8763	-29.5037	50.9987	37.1156	7.2714

16	39	208.8742	-30.8818	48.8833	39.8134	7.2268
17	39	208.8762	-32.1451	46.7008	42.5208	7.2009
18	39	208.8813	-33.2900	44.4586	45.2351	7.1501
19	39	208.8884	-34.3148	42.1649	47.9535	7.1189
20	39	208.8968	-35.2215	39.8228	50.6795	7.0982
1	40	206.0716	-1.2254	68.7885	1.2257	7.4807
2	40	206.0753	-3.6668	68.3450	3.6884	7.4710
3	40	206.0802	-6.0840	67.7880	6.1621	7.4525
4	40	206.0870	-8.4629	67.0904	8.6421	7.4212
5	40	206.0968	-10.7860	66.2289	11.1252	7.3838
6	40	206.1081	-13.0372	65.1922	13.6120	7.3557
7	40	206.1185	-15.1975	63.9760	16.1013	7.3220
8	40	206.1263	-17.2489	62.5826	18.5925	7.2992
9	40	206.1313	-19.1904	61.0369	21.0919	7.2781
10	40	206.1333	-21.0417	59.3847	23.6093	7.2542
11	40	206.1329	-22.8196	57.6532	26.1525	7.2447
12	40	206.1311	-24.5260	55.8501	28.7218	7.2167
13	40	206.1288	-26.1574	53.9777	31.3153	7.2023
14	40	206.1266	-27.7038	52.0336	33.9291	7.1679
15	40	206.1250	-29.1595	50.0202	36.5605	7.1509
16	40	206.1243	-30.5189	47.9409	39.2066	7.1149
17	40	206.1250	-31.7751	45.7985	41.8642	7.0949
18	40	206.1267	-32.9247	43.5988	44.5304	7.0541
19	40	206.1291	-33.9647	41.3486	47.2015	7.0272
20	40	206.1319	-34.8955	39.0503	49.8791	7.0096

APPENDIX E

COMPUTER CODE INTERP

```
      PROGRAM INTERP
$DEBUG
C
C  This program was written to support the B-1B Transparency Test,
C  JON 24010505, May 1990.
C
C  For a given Mach number, altitude, and angle cf attack, this program
C  interpolates Cp data from Mach number and alpha tables to produce
C  pressure in psi at panel centroids.
C
C  This is version 2.  It creates plot files for TECPLOT internally.
C
      REAL MACH,MACH0,MAX,MIN,MSTAR
      CHARACTER*46 TITLE
      CHARACTER*10 FILENAME(6),TAPE,FILE2,FILE3,FILE4,FILE5
      DIMENSION CP(20,40),DP(20,40),DT(20,40),TEMP(40)
      DIMENSION ROATM(101),PATM(101),SSATM(101),TATM(101),A(6)
      DIMENSION MACH(6),NALPHA(6),ALPHA(6,5),COUNT(6)
      NTABLE=6
      GAMMA=1.4
      EXP=(GAMMA-1.)/GAMMA
      DATA CP/800*0.0/
      DATA MACH/.30,.56,.70,.75,.[illegible],.91/
      DATA NALPHA/3,2,4,3,3,3/
      DATA ALPHA/0.,0.,0.,0.,0.,0.,
     *           4.,2.,1.,1.,1.,1.,
     *           8.,0.,2.,2.,2.,2.,
     *           0.,0.,3.,0.,0.,0.,
     *           0.,0.,0.,0.,0.,0./
      DATA COUNT/1.,2.,3.,4.,5.,6./
C
C  Atmospheric data
C
      DATA ROATM /                          .23770,.23080,
     *.22410,.21750,.21110,.20480,.19870,.19270,.18680,.18110,
     *.17550,.17010,.16480,.15960,.15450,.14960,.14470,.14000,
     *.13550,.13100,.12660,.12240,.11830,.11420,.11030,.10650,
     *.10280,.09920,.09570,.09230,.08890,.08570,.08260,.07950,
     *.07650,.07370,.07090,.06760,.06440,.06140,.05850,.05580,
     *.05310,.05070,.04830,.04600,.04390,.04180,.03980,.03800,
     *.03620,.03448,.03286,.03132,.02985,.02845,.02711,.02584,
     *.02463,.02347,.02237,.02132,.02032,.01937,.01846,.01759,
     *.01676,.01595,.01518,.01445,.01376,.01310,.01247,.01187,
     *.01131,.01077,.01025,.00976,.00930,.00886,.00844,.00804,
     *.00767,.00730,.00696,.00663,.00632,.00602,.00574,.00547,
     *.00522,.00497,.00474,.00452,.00431,.00411,.00392,.00374,
     *.00357,.00340,.00324/
      DATA PATM /                     2116.2,2040.8,
     *1967.7,1896.6,1827.7,1760.8,1695.9,1632.9,1571.9,1512.7,
     *1455.3,1399.7,1345.9,1293.7,1243.2,1194.3,1146.9,1101.1,
     *1056.8,1013.9, 972.5, 932.4, 893.7, 856.3, 820.2, 785.3,
     * 751.6, 719.1, 687.8, 657.6, 628.4, 600.3, 573.3, 547.2,
     * 522.1, 498.0, 474.7, 452.4, 431.2, 411.0, 391.7, 373.3,
     * 355.8, 339.1, 323.2, 308.0, 293.5, 279.8, 266.6, 254.1,
     * 242.2, 230.8, 220.0, 209.7, 199.9, 190.5, 181.5, 173.0,
     * 164.9, 157.2, 149.8, 142.8, 136.1, 129.7, 123.6, 117.8,
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     * 112.3, 107.0, 102.0,  97.2,  92.7,  88.4,  84.3,  80.3,
     *      76.6,  73.1,  69.7,  66.5,  63.4,  60.5,  57.7,  55.0,
     *      52.5,  50.1,  47.8,  45.6,  43.5,  41.5,  39.6,  37.8,
     *      36.1,  34.5,  32.9,  31.4,  30.0,  28.7,  27.4,  26.1,
     *      25.0,  23.8,  22.8/
      DATA SSATM /                          661.03,659.20,
     *656.92,654.63,652.32,650.00,647.69,645.36,643.02,640.69,
     *638.34,635.97,633.60,631.22,628.83,626.44,624.03,621.62,
     *619.19,616.76,614.31,611.86,609.40,606.93,604.44,601.95,
     *599.44,596.93,594.41,591.86,589.32,586.77,584.20,581.62,
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     *573.57,573.57,573.57,573.57,573.57,573.57,573.57,573.57,
     *573.57,573.16,573.16,573.16,573.16,573.16,573.16,573.16,
     *573.16,573.16,573.16,573.16,573.16,573.16,573.16,573.16,
     *573.32,573.72,574.12,574.53,574.92,575.33,575.73,576.13,
     *576.53,576.94,577.37,577.73,578.14,578.53,578.93,579.33,
     *579.73,580.13,580.53,580.93,581.33,581.72,582.12,582.52,
     *582.91,583.31,583.71,584.10,584.50,584.89,585.29,585.68,
     *586.08,586.47,586.86/
      DATA TATM /                       518.67,515.10,
     *511.54,507.97,504.40,500.84,497.27,493.71,490.14,486.57,
     *483.01,479.44,475.87,472.31,468.74,465.18,461.61,458.04,
     *454.48,450.91,447.35,443.78,440.21,436.65,433.08,429.52,
     *425.95,422.38,418.82,415.25,411.68,408.12,404.55,400.99,
     *397.41,393.85,390.29,389.97,389.97,389.97,389.97,389.97,
     *389.97,389.97,389.97,389.97,389.97,389.97,389.97,389.97,
     *389.97,389.97,389.97,389.97,389.97,389.97,389.97,389.97,
     *389.97,389.97,389.97,389.97,389.97,389.97,389.97,389.97,
     *390.18,390.73,391.28,391.83,392.37,392.92,393.47,394.02,
     *394.57,395.12,395.67,396.22,396.76,397.31,397.86,398.41,
     *398.96,399.51,400.06,400.60,401.15,401.70,402.30,402.80,
     *403.35,403.90,404.44,404.99,405.54,406.90,406.64,407.19,
     *407.74,408.28,408.83/
C
C  Define input files containing areo data
C
      FILENAME(1)='CANOPY.M30'
      FILENAME(2)='CANOPY.M56'
      FILENAME(3)='CANOPY.M70'
      FILENAME(4)='CANOPY.M75'
      FILENAME(5)='CANOPY.M85'
      FILENAME(6)='CANOPY.M91'
C
C  Read the flight condition
C
      WRITE(*,*)' INPUT MACH NUMBER (F10)'
      READ(*,'(F10.3)')MACH0
      WRITE(*,*)' INPUT ANGLE OF ATTACK OR GROSS WEIGHT/1000'
      READ(*,'(F10.3)')ALPHA0
      IF(ALPHA0.LE.30.0) GOTO 2
      WRITE(*,*)' INPUT WING SWEEP ANGLE (F10)'
      READ(*,'(F10.3)')SWEEPLE
    2 CONTINUE
      WRITE(*,*)' INPUT ALTITUDE DIVIDED BY 1000'
      READ(*,'(F10.3)')ALT0
C
C  Obtain properties of the atmosphere at altitude
C
      NALT=IFIX(ALT0)+1
      RHO=ROATM(NALT)/100.
      P0=PATM(NALT)
      PINT=P0
```

```
      IF(PINT.LT.1571.877) PINT=1571.877
      SS=SSATM(NALT)*1.689
      TO=TATM(NALT)
C
      Q=0.5*RHO*(MACHO*SS)**2
      WRITE(*,'(4H Q =,F10.5,4H PSF)')Q
C
C  Calculate angle of attack if not supplied
C
      IF(ALPHAO.LE.30.0) GOTO 3
      WEIGHT=1000.0*ALPHAO
      AREA=1907.0+(2259.0-1907.0)*(SWEEPLE-15.0)/(65.-15.)
      SPAN=(254.0+1386.0*COS((SWEEPLE-6.2)/57.2958))/12.
      AR=SPAN*SPAN/AREA
      SWEEP=SWEEPLE-5.5
      TPR=0.35+(.526-0.35)*(SWEEPLE-15.0)/(65.-15.)
C
      CALL CLALPHA(MACHO,AR,SWEEP,TPR,CLA,MSTAR)
C
      CL=WEIGHT/Q/AREA
C
C  Alpha Body  = (CL/CLA) - (Alpha zero lift of wing) - (Alpha wing/body)
C
C  Alpha zero lift of wing may be a weak function of Mach number
C
C  Assume:
C
      ALPZERO = 0.5
C
C  Alpha wing/body may be a function of wing sweep
C
C  Assume:
C
      ALPWB = 1.5
C
      ALPHAO=CL/CLA*57.2958  -ALPZERO - ALPWB
C
      WRITE(*,*)' MACH,WEIGHT,SWEEP,ALPHA,CL,CLA,AREA,SPAN,AR,TPR'
      WRITE(*,6000)MACHO,WEIGHT,SWEEPLE,ALPHAO,CL,CLA,AREA,SPAN,AR,TPR
 6000 FORMAT(F6.3,F8.0,F5.1,F6.2,F6.3,F6.3,F7.0,F6.1,F6.3,F5.3)
    3 CONTINUE
C
C  Find the closest Mach number and name of the datafile.
C
      MIN=100
      DO 10 I=1,NTABLE
      TEST=ABS(MACHO-MACH(I))
      IF(TEST.GT.MIN) GOTO 10
      IMACH=I
      MIN=TEST
   10 CONTINUE
C
C  Select pair of alpha tables for interpolation/extrapolation
C
      N=NALPHA(IMACH)
      DO 5 I=1,N
    5 A(I)=ALPHA(IMACH,I)
      CALL INTER(A,COUNT,N,ALPHAO,FACTR)
C
C  Calculate interpolation/extrapolation multipliers for pair of tables
C
      NTABL1=IFIX(FACTR)
```

```
      NTABL2=NTABL1+1
      FACTR2=FACTR-FLOAT(NTABL1)
      IF(NTABL2.GT.N) NX=NTABL2-N
      IF(NTABL1.LT.1) NX=NTABL1-1
      IF(NX.NE.0)WRITE(*,*)' CAUTION - EXTRAPOLATING DATA'
      FACTR2=FACTR2+NX
      FACTR1=1.-FACTR2
      NTABL1=NTABL1-NX
      NTABL2=NTABL2-NX
C
      I=IMACH
      WRITE(*,1002)ALPHA(I,NTABL1),FACTR1,ALPHA(I,NTABL2),FACTR2
 1002 FORMAT(F3.0,16H deg data times ,F8.4,5H plus,
     *           F3.0,16H deg data times ,F8.4)
C
C  Read the aero file and scale the data
C
      TAPE=FILENAME(IMACH)
      FILE2='CP.OUT'
      FILE3='DP.OUT'
      FILE4='DT.OUT'
      FILE5='MAXMIN.OUT'
      OPEN(1,FILE=TAPE,STATUS='OLD')
      OPEN(2,FILE=FILE2,STATUS='NEW')
      OPEN(3,FILE=FILE3,STATUS='NEW')
      OPEN(4,FILE=FILE4,STATUS='NEW')
      OPEN(5,FILE=FILE5,STATUS='NEW')
      DO 20 K=1,6
      IF(K.GT.NTABL2) GOTO 30
      FACTR=0.0
      IF(K.EQ.NTABL1)FACTR=FACTR1
      IF(K.EQ.NTABL2)FACTR=FACTR2
      READ(1,2000)TITLE
      WRITE(*,2000)TITLE
 2000 FORMAT(A46)
      DO 20 I=1,20
      READ(1,2000)TITLE
      READ(1,3000)(TEMP(J),J=1,40)
 3000 FORMAT(F9.6,7F10.6)
 3001 FORMAT(F9.5,7F10.5)
 3002 FORMAT(F9.3,7F10.3)
      DO 20 J=1,40
   20 CP(I,J)=CP(I,J)+TEMP(J)*FACTR
   30 CONTINUE
C
C  Calculate pressure and temperature differential
C
C  DP is the inside pressure minus the outside pressure in PSI
C
C  DT is the outside termperature in degrees F
C
      DO 35 I=1,20
      DO 35 J=1,40
      CPIJ=CP(I,J)
      DT(I,J)=T0*((P0+Q*CPIJ)/P0)**EXP - 459.6
   35 DP(I,J)=(PINT-P0-CPIJ*Q)/144.
C
C  Output CP, DP, and DT on separate files
C
      WRITE(2,4000)MACH0,ALPHA0
      WRITE(3,4001)MACH0,ALPHA0
      WRITE(4,4002)MACH0,ALPHA0
```

```
 4000 FORMAT('B1 CANOPY CP FOR MACH ='F6.3' AND ALPHA ='F5.2)
 4001 FORMAT('B1 CANOPY DP FOR MACH ='F6.3' AND ALPHA ='F5.2)
 4002 FORMAT('B1 CANOPY DT FOR MACH ='F6.3' AND ALPHA ='F5.2)
C
      DO 40 I=1,20
      WRITE(2,5000)I
      WRITE(3,5001)I
      WRITE(4,5002)I
 5000 FORMAT('CP(I,J) FOR I = 'I3' AND J = 1 THROUGH 40')
 5001 FORMAT('DP(I,J) FOR I = 'I3' AND J = 1 THROUGH 40')
 5002 FORMAT('DT(I,J) FOR I = 'I3' AND J = 1 THROUGH 40')
      WRITE(2,3000)(CP(I,J),J=1,40)
      WRITE(3,3001)(DP(I,J),J=1,40)
   40 WRITE(4,3002)(DT(I,J),J=1,40)
C
C  Locate max and min of CP, DP and DT
C
      WRITE(5,4000)MACH0,ALPHA0
      CALL MAXMIN(CP,MAX,IMAX,JMAX,MIN,IMIN,JMIN)
      WRITE(*,5500)IMAX,JMAX,MAX,IMIN,JMIN,MIN
      WRITE(5,5500)IMAX,JMAX,MAX,IMIN,JMIN,MIN
 5500 FORMAT(' MAX IS CP('I2','I2')='F10.6
     1         ',  MIN IS CP('I2','I2')='F10.6//)
C
      WRITE(5,4001)MACH0,ALPHA0
      CALL MAXMIN(DP,MAX,IMAX,JMAX,MIN,IMIN,JMIN)
      WRITE(*,5501)IMAX,JMAX,MAX,IMIN,JMIN,MIN
      WRITE(5,5501)IMAX,JMAX,MAX,IMIN,JMIN,MIN
 5501 FORMAT(' MAX IS DP('I2','I2')='F10.6
     1         ',  MIN IS DP('I2','I2')='F10.6//)
C
      WRITE(5,4002)MACH0,ALPHA0
      CALL MAXMIN(DT,MAX,IMAX,JMAX,MIN,IMIN,JMIN)
      WRITE(*,5502)IMAX,JMAX,MAX,IMIN,JMIN,MIN
      WRITE(5,5502)IMAX,JMAX,MAX,IMIN,JMIN,MIN
 5502 FORMAT(' MAX IS DT('I2','I2')='F10.6
     1         ',  MIN IS DT('I2','I2')='F10.6//)
C
C   Create plot files for CP, DP, and DT
C
      CLOSE(2)
      CLOSE(3)
      CLOSE(4)
      CALL PLOT2(FILE2)
      CALL PLOT2(FILE3)
      CALL PLOT2(FILE4)
      STOP
      END
C
C
C
      SUBROUTINE MAXMIN(A,MAX,IMAX,JMAX,MIN,IMIN,JMIN)
C
C  This subroutine locates the maximum and minimum values in
C  the array A together with the index of each.
C
      REAL MAX,MIN
      DIMENSION A(20,40)
C
      MAX=A(1,1)
      MIN=A(1,1)
      IMAX=1
```

```
      JMAX=1
      IMIN=1
      JMIN=1
C
      DO 10 I=1,20
      DO 10 J=1,40
C
      IF(A(I,J).LT.MAX) GOTO 5
      MAX=A(I,J)
      IMAX=I
      JMAX=J
    5 CONTINUE
C
      IF(A(I,J).GT.MIN) GOTO 10
      MIN=A(I,J)
      IMIN=I
      JMIN=J
   10 CONTINUE
C
      RETURN
      END
C
C
C
      SUBROUTINE INTER(X,Y,NPTS,XVAL,YANS)
C
C     TWO DIMENSIONAL TABLE LOOKUP
C     X-INDEPENDENT TABLE
C     Y-DEPENDENT TABLE
C     NPTS-NUMBER OF VALUES IN EITHER X OR Y TABLE
C     XVAL-INDEPENDENT ARGUMENT
C     YANS-CALCULATED RESULT
C
      DIMENSION X(1),Y(1)
      I=NPTS
      IF(XVAL-X(I))5,30,35
 5    IF(XVAL-X(1))7,15,20
 7    IF(X(I)-X(1))8,8,9
 8    I=NPTS-1
      GO TO 50
 9    I=1
      GO TO 50
 15   YANS=Y(1)
      GO TO 55
 20   IF(XVAL-X(I))25,25,50
 25   I=I-1
      GO TO 20
 30   YANS=Y(I)
      GO TO 55
 35   IF(XVAL-X(1))40,15,36
 36   IF(X(I)-X(1))9,9,8
 40   IF(XVAL-X(I))50,45,45
 45   I=I-1
      GO TO 40
 50   YANS=(Y(I+1)-Y(I))/(X(I+1)-X(I))*(XVAL-X(I))+Y(I)
 55   RETURN
      END
C
C
      SUBROUTINE PLOT2(AEROFILE)
C
C  This version is adapted to TECPLOT to produce contour plots.
```

```
C
C  This program reads the geometry file and an aero file and writes a
C  file to produce contour plots of Cp, delta P, or delta T on the
C  surface of the canopy.
C
      CHARACTER*10 TITLE1
      CHARACTER*2  TITLE2
      CHARACTER*60 TITLE3
      CHARACTER*10 AEROFILE
      REAL MACH
      DIMENSION CP(20,40),X(20,40),S(20,40)
C
      WRITE(*,500)AEROFILE
  500 FORMAT(' Generating plot file for 'A6)
      OPEN(1,FILE=AEROFILE,STATUS='OLD')
      OPEN(2,FILE='CANOPY.SRF',STATUS='OLD')

C
C  Read the geometry file
C
      READ(2,1000)TITLE1,TITLE2,TITLE3
 1000 FORMAT(A10,A2,A60)
      WRITE(*,1000)TITLE1,TITLE2,TITLE3
      READ(2,1000)TITLE3
C
      DO 10 J=1,40
      DO 10 I=1,20
      READ(2,2000)II,JJ,XX,YY,ZZ,SS
 2000 FORMAT(I3,I4,4F10.4)
      X(II,JJ)=XX
   10 S(II,JJ)=SS
C
C  Read the aero file, one Mach and alpha at a time
C
      WRITE(*,3500)AEROFILE
 3500 FORMAT(' Ready to read AEROFILE as',A10)
   20 READ(1,3000,END=999)TITLE2,MACH,ALPHA
 3000 FORMAT(10X,A2,11X,F6.3,12X,F5.2)
      WRITE(*,4000)TITLE2,MACH,ALPHA
 4000 FORMAT(' READING 'A2' DATA:  MACH ='F6.3';  ALPHA ='F5.2)
C
C  Read CP, DP, or DT
C
      DO 30 I=1,20
      READ(1,6000)II
 6000 FORMAT(15X,I4)
   30 READ(1,7000)(CP(II,J),J=1,40)
 7000 FORMAT(F9.6,7F10.6)
C
C  Write plot file title and variables
C
      WRITE(*,7500)TITLE2
 7500 FORMAT(' Writing plot file 'A2)
      OPEN(3,FILE=TITLE2,STATUS='NEW')
      WRITE(3,8000)TITLE2,MACH,ALPHA,TITLE2
 8000 FORMAT(9HTITLE = ",A2,9H FOR MACH,F4.2,5H AND ,F4.2,5H DEG"/
     1          18HVARIABLES = X, S, A2)
C
C  Write plot zone title and indices
C
      WRITE(3,9000)
 9000 FORMAT(29HZONE T = "ZONE-1", I=20, J=18)
```

```
      DO 40 J=3,38,2
      DO 40 I=1,20
   40 WRITE(3,10000)X(I,J),S(I,J),CP(I,J)
10000 FORMAT(F10.4,F10.4,F10.5)
      GOTO 20
  999 CLOSE(3)
      RETURN
      END
C
      SUBROUTINE CLALPHA (MACH,AAR,XSWEP,TTPR,X,XMSTR)
C
C  This subroutine calculates the lift curve slope using an impirical
C  formula used for preliminary design.
C
C     AAR=ASPECT RATIO
C     MACH=MACH NUMBER
C     TTPR=TAPER RATIO=WING TIP CHORD DIVIDED BY ROOT CHORD
C     X=LIFT CURVE SLOPE
C     XSWEP=ANGLE OF SWEEP BACK OF THE 50 PERCENT CHORD LINE
C
      REAL MACH
      E = 8.0/3.0
      F = 4.0/3.0
      G = 2.0/3.0
      SSWEP = XSWEP/57.29578
      XMSO = (10. + .91 * AAR ** 3)/(10. + AAR ** 3)
      XMSTR = XMSO + (1. - XMSO) * (1. - COS(SSWEP)) ** 2
      CONE = (3.14159 * AAR)/(1. + SQRT(1. + ABS(1. - (COS(SSWEP))
     1 ** F * (MACH/XMSTR) ** E) * (AAR/(2. * COS(SSWEP))) ** 2))
      IF (MACH.GT.XMSTR) GO TO 100
      X = CONE
      GOTO 1000
  100 Z = (XMSTR*CONE) + ((AAR**2)/(((3.*3.14159*AAR)/CONE)*
     1 ((3.14159*AAR)/(CONE)-1.)*(COS(SSWEP)**G)))
      Y = ((1. + 3.14159*AAR)/(3. + 3.14159 * AAR)) * (2.-G *
     1 SQRT(TTPR) - (TTPR) ** 2)
      BE = (MACH - XMSTR) * ((1. + (XMSTR/MACH) ** Y)) ** 2
      X = 1./((1./CONE) * (XMSTR/MACH) ** Z + (BE/4))
 1000 RETURN
      END
```

APPENDIX F

COMPUTER CODE SURF

```
      PROGRAM SURF
C
C  This program determines the distance along each cross section
C  from the top of the canopy at the center line to the centroid
C  of the panel.
C
C  It is one step in producing a contour plot of pressure and
C  temperature on the surface of the canopy.
C
      CHARACTER*72 TITLE
      REAL M,M12
C
      DIMENSION X(20,40),Y(20,40),Z(20,40),A(20,40)
C
      OPEN(1,FILE='D:CANOPY.GEO',STATUS='OLD')
      OPEN(2,FILE='D:CANOPY.SRF',STATUS='NEW')
      OPEN(3,FILE='D:CANOPY.RAD',STATUS='NEW')
      WRITE(3,*)' CURVATURE DATA: X,YBAR,ZBAR,RADIUS'
      READ(1,1000)TITLE
 1000 FORMAT(A72)
      WRITE(2,1000)TITLE
      READ(1,1000)TITLE
      WRITE(2,*)' I, J, XBAR, YBAR, ZBAR, S, AREA'
C
      DO 10 I=1,20
      DO 10 J=1,40
      READ(1,2000)II,JJ,XX,YY,ZZ,XCOS,YCOS,ZCOS,AREA
 2000 FORMAT(I3,I4,3F10.4,4F10.6)
      X(II,JJ)=XX
      Y(II,JJ)=YY
      Z(II,JJ)=ZZ
      A(II,JJ)=AREA
   10 CONTINUE
C
      DO 20 J=1,40
      SUM=0.
      THETA0=0.0
C
C  Calculate radius of curvature from three points on a circle
C
C  Get three points
C
      Y1=Y(1,J)
      Z1=Z(1,J)
      Y2=Y(20,J)
      Z2=Z(20,J)
      XX=X(10,J)
      Y3=Y(10,J)
      Z3=Z(10,J)
C
C  Find point on, and slope of line containing center of curvature
C
      YBAR=(Y1+Y2)/2.
      ZBAR=(Z1+Z2)/2.
      M12=(Z2-Z1)/(Y2-Y1)
      M=-1./M12
```

```
      B=ZBAR-M*YBAR
C
C  Find center of curvature
C
      YO=.5*(Z3*Z3-Z1*Z1+Y3*Y3-Y1*Y1-2.*B*(Z3-Z1))/(M*(Z3-Z1)+Y3-Y1)
      ZO=M*YO+B
      RO=SQRT((ZO-Z1)**2+(YO-Y1)**2)
      WRITE(3,2001)XX,YO,ZO,RO
 2001 FORMAT(4F10.4)
C
      DO 20 I=1,20
C
      XX=X(I,J)
      YY=Y(I,J)
      ZZ=Z(I,J)
      AREA=A(I,J)
C
      ZBAR=ZO
C
      R=SQRT((ZZ-ZBAR)**2+YY*YY)
      THETA=ACOS((ZZ-ZBAR)/R)
      DTHETA=THETA-THETAO
      IF(I.EQ.1)RO=R
      RAVG=(R+RO)/2.
      SUM=SUM+RAVG*DTHETA
      SS=SUM
      THETAO=THETA
C
      WRITE(2,2003)I,J,XX,YY,ZZ,SS,AREA
 2003 FORMAT(I3,I4,5F10.4)
   20 CONTINUE
      STOP
      END
```

APPENDIX G

COMPUTER CODE CANOPY

```
      PROGRAM CANOPY
C
C  This program reads the QUADPAN dump file and writes selected parameters
C  to output files.
C
C  The X,Y,Z locations of the centroids of the panels, the direction cosines,
C  and the areas are read.
C
C  The pressure coefficients are read for each combination of Mach number and
C  angle of attack in the QUADPAN run.
C
C  This program was adapted from the program LOADIT written by John Riechers
C  for use in determining the pressures on the B-1B Canopy for a variety of
C  flight conditions to support a test by Captain John Anselmo, Summer 1990.
C
C
      COMMON/MAIN1/CMACH,ALPHA,NFLWS,IFLAG,CNTROID(2000,3),
     1 DIRECOS(2000,3),AREA(2000),CP(2000)
C
      IFLAG=1
C
C     ***** IDENTIFY THE SOURCE OF AERO DATA *****
C
      OPEN(2,FILE='B1FUS2.DMP',STATUS='OLD')
      OPEN(3,FILE='CANOPY.GEO',STATUS='NEW')
      OPEN(4,FILE='CANOPY.ARO',STATUS='NEW')
      I=0
 4010 READ (2,4020,END=4030) QU
 4020 FORMAT(A4)
      I=I+1
      IF (QU.EQ.'QUAD') GOTO 4050
      IF (I.LT.2000) GOTO 4010
C
C     ***** THE AERO SOURCE CANNOT BE IDENTIFIED *****
C
 4030 WRITE (*,4040)
 4040 FORMAT(' FILE 2 was not identified as a QUADPAN dump file')
      STOP 01
C
C     ***** THE AERO DATA HAS BEEN IDENTIFIED *****
C     *****   AS A QUADPAN DUMP FILE      *****
C
 4050 WRITE (*,4060)
 4060 FORMAT(' FILE 2 has been identified as a QUADPAN file.')
 9000 CONTINUE
C
C     ***** READ CP FOR ONE FLIGHT CONDITION *****
C
      CALL READQUAD
C
C     ***** WRITE CP FOR ONE FLIGHT CONDITION *****
C
      CALL WRITECP
C
C     *****  IF LAST FLOW CONDITION, THEN STOP PROGRAM   *****
C     ***** IF NOT, THEN CONTINUE WITH NEXT FLOW CONDITION *****
```

```
C
      IF (IFLAG .EQ. NFLWS) STOP 02
      IFLAG=IFLAG+1
      GO TO 9000
      END
C
C
      SUBROUTINE READQUAD
C
C     *****   THIS SUBROUTINE READS A QUADPAN DUMP FILE,    *****
C     *****       EXTRACTS THE REQUIRED INFORMATION   *****
C
      COMMON/MAIN1/CMACH,ALPHA,NFLWS,IFLAG,CNTROID(2000,3),
     1 DIRECOS(2000,3),AREA(2000),CP(2000)
C
C     *****    READ IN GEOMETRY DATA     *****
C     ***** ONLY IF THIS IS THE FIRST PASS *****
C
      IF (IFLAG .GT. 1) GO TO 170
C
C     ***** DETERMINE NUMBER OF FLOW CONDITIONS AND NUMBER OF *****
C     *****          ELEMENTS IN MODEL                  *****
C
    1 READ (2,10) GL
   10 FORMAT (A4)
      IF (GL .NE. 'GLOB') GO TO 1
      READ (2,20) ITOTL, NFLWS
   20 FORMAT (//2(12X,I6))
C
C
C     *****  DETERMINE POSITIONS OF CONTROL POINTS,  *****
C     ***** DIRECTION COSINES, AND AREAS OF ELEMENTS *****
C
   70 READ (2,10) GE
      IF (GE .NE. 'GEOM') GO TO 70
      READ (2,90)
   90 FORMAT (///)
      DO 110 K=1,ITOTL
      READ (2,100) (CNTROID(K,J),J=1,3), (DIRECOS(K,KK),KK=1,3), AREA(K)
  100 FORMAT (/5G15.7,/,2G15.7)
  110 CONTINUE
C
C     ***** THE FOLLOWING ARE TO BE REPEATED *****
C     *****   FOR EACH FLOW CONDITION      *****
C
C     ***** DETERMINE MACH NUMBER *****
C
  170 READ (2,10) OU
      IF (OU .NE. 'OUTP') GO TO 170
      READ (2,180) CMACH,ALPHA
  180 FORMAT (/////2G15.7)
C
C     ***** DETERMINE COEFFICIENTS OF PRESSURE *****
C
  190 READ (2,10) PR
      IF (PR .NE. 'PRES') GO TO 190
      READ (2,210)
  210 FORMAT (//)
      DO 230 K=1,800
      READ (2,220) CP(K)
  220 FORMAT (//G15.7)
  230 CONTINUE
```

```
C
      RETURN
      END
C
      SUBROUTINE WRITECP
C
C     ***** THIS SUBROUTINE WILL WRITE GEOMETRY AND PRESSURE *****
C     *****       COEFFICIENTS ON AN OUTPUT FILE             *****
C
      DIMENSION OUT(7)
      COMMON/MAIN1/CMACH,ALPHA,NFLWS,IFLAG,CNTROID(2000,3),
     1 DIRECOS(2000,3),AREA(2000),CP(2000)
C
      IF (IFLAG.GT.1) GO TO 30
      WRITE(3,1000)
 1000 FORMAT(' GEOMETRY B1 CANOPY'/
     1           ' I,J,XBAR,YBAR,ZBAR,XCOS,YCOS,ZCOS,AREA')
C
      DO 20 I=1,20
      DO 20 J=1,40
      K=40*(I-1)+J
      DO 21 L=1,3
      OUT(L)=CNTROID(K,L)
   21 OUT(L+3)=DIRECOS(K,L)
      OUT(7)=AREA(K)
   20 WRITE(3,2000)I,J,OUT
 2000 FORMAT(2I4,3F10.4,3F10.7,F10.6)
C
   30 CONTINUE
      WRITE(4,3000)CMACH,ALPHA
 3000 FORMAT(' B1 CANOPY CP FOR MACH ='F6.3' AND ALPHA ='F5.2)
C
      DO 40 I=1,20
      WRITE(4,4000)I
 4000 FORMAT(' CP(I,J) FOR I = 'I3' AND J = 1 THROUGH 40')
      KFIRST=40*(I-1)+1
      KLAST=KFIRST+39
   40 WRITE(4,5000)(CP(K),K=KFIRST,KLAST)
 5000 FORMAT(8F10.6)
      RETURN
      END
```